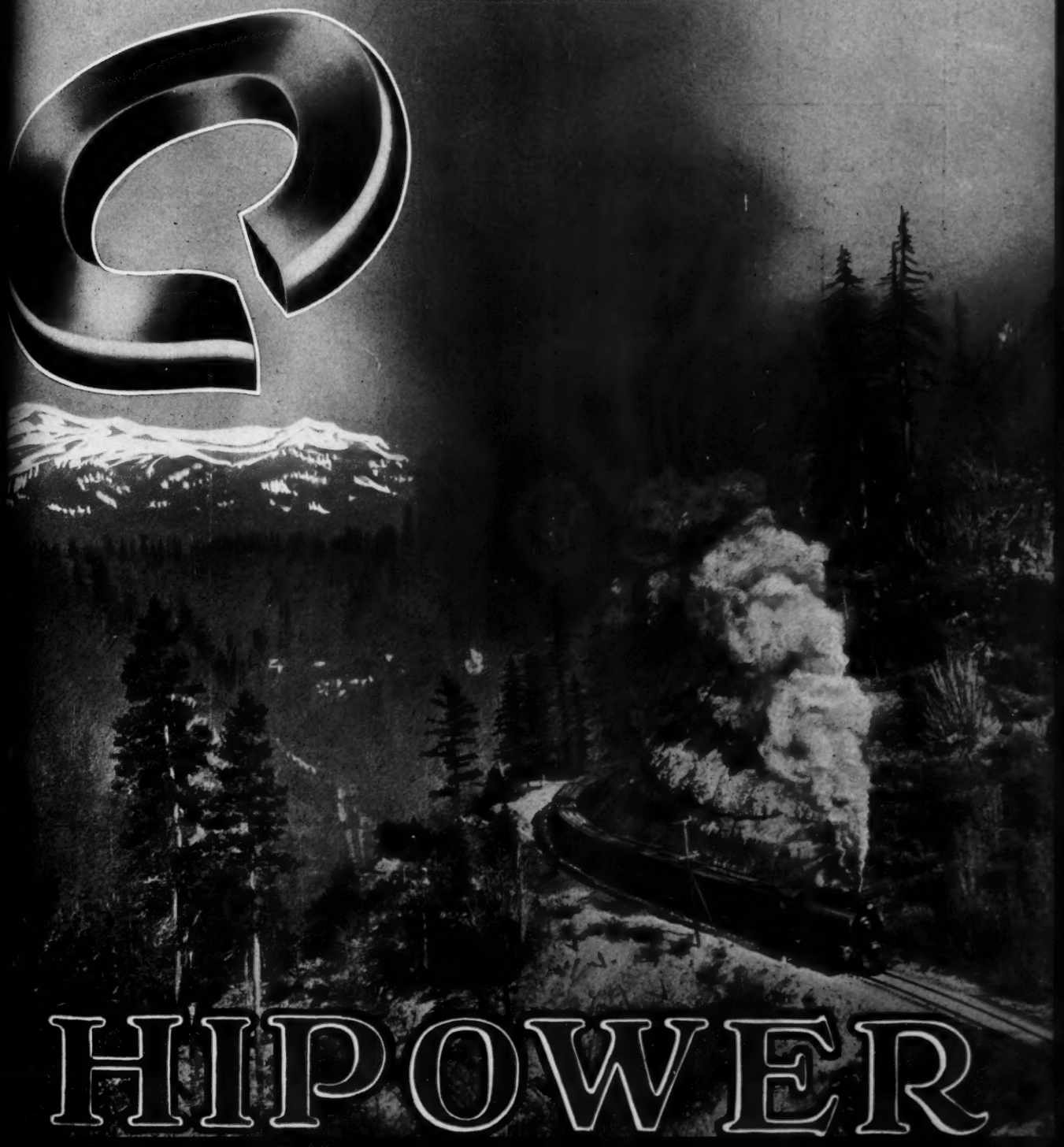
DECEMBER, 1923

Railway Engineering and Maintenance



RAILWAY ENGINEERING AND MAINTENANCE
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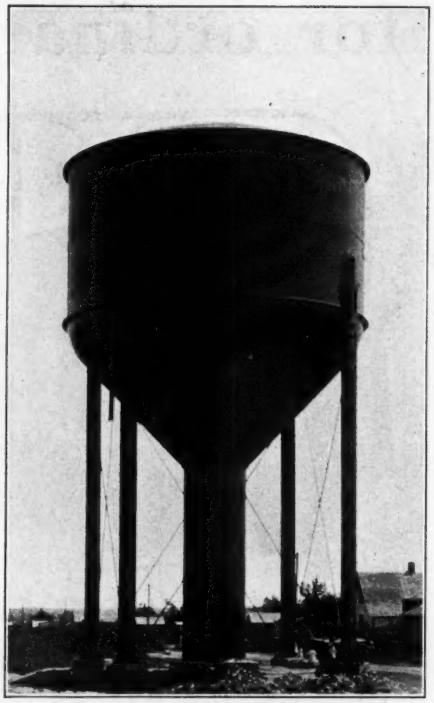
Alphabetical Index to Advertisements, Page 32 Classified Index to Advertisers, Pages 30 and 32

Shape of Conical-bottom Aids Sludge Removal

A sludge collection area with a diameter of only six feet is a revelation.

In the flat-bottom tank, sludge collects over the entire bottom—an area of 645.42 square feet for a 48-foot diameter. Compare this to an area of 28.27 square feet of settling basin in the conical-bottom tank of the same diameter with a six foot riser pipe. Common sense tells you it is easier to clean sludge from an area of 28 square feet than it is from 645 square feet, for there is 95.6 per cent less space.

The experience of the Illinois Central, as related by C. R. Knowles in the July, 1923, issue of this magazine, was that it took 1,200 to 1,500 gallons of water to clean 520 pounds of sludge from a HORTON Conical-bottom tank and 8,000 to 10,000 to clean the same amount from a flat-bottom tank.



100,000-Gallon Tank at Brush, Colorado, C. B. & Q. Railroad.

The Conical-bottom is the only tank that is 100 per cent suitable for both road side delivery and softening purposes.

Cleans better with less water

Not only does the Conical-bottom tank take less water, but it is cleaned much more thoroughly and without putting the tank out of service. The tests of the Illinois Central showed that flat-bottom tanks could not be thoroughly cleaned. And they are out of service for a short time, for during sludge removal and shortly after, the water in the tank is somewhat dirty.

With the Conical-bottom, sludge removal does not dirty the water in the tank. It is all retained in a small receptacle and the minute the washout valve is opened, it moves outward. Water for service is drawn from a point several feet above the basin—a point where the water is always clear.

This easy and thorough method of sludge removal saves you from 8,000 to 9,000 gallons of water a day at each tank, and gives you continuous service of your tank. The shape of the Conical-bottom is ideal for treating, there is no dead water space in it. The rate of up-flow is less than in the flat-bottom, providing more thorough treatment. Specify HORTON Conical-bottom steel tanks for roadside delivery or softener service.

The **HORTON**
Conical-bottom Tank

Chicago Bridge & Iron Works

238

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On the Grand Trunk in Maine.

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 19 December, 1923 Number 12

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Whether it pays to creosote crossing planks?

What tools a bridge gang needs?

How to relay rail at the rate of a track mile per hour?

How to maintain motor cars?

What is the largest reservoir for railway water supply in the United States?

Answers to these and other practical questions will be found elsewhere in this issue.

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Ingersoll-Rand Hammer drives the rivets

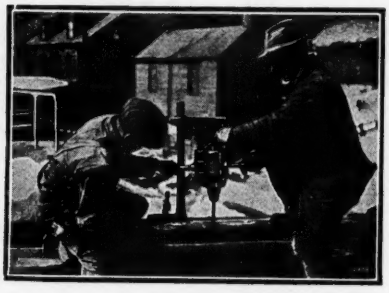
Do the Work With Air and Save Labor

Ingersoll-Rand Bridge Repair Outfits enable a gang of five or six men to perform all the operations incident to the maintenance of bridges and structures. They effect a great saving of time and labor.

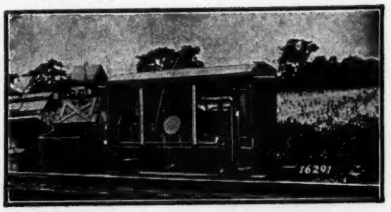
The outfit consists of a Tie Tamper Compressor Car, operated by a gasoline engine and self propelled. This car is suitable for the operating of a pneumatic drill, riveting hammer, sand blast nozzle and paint spray nozzle in intermittent service.

For work requiring a larger supply of air or more air lines the compressor shown below is furnished. It operates several pneumatic drills or hammers at the same time or will supply air for a cement gun, or larger sand blast and paint spray outfits.

When not used for repair work, these compressors are kept busy on regular track construction and maintenance operations.



Ingersoll-Rand Air Drill for drilling and reaming



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Compare the wearing qualities of the blades. Compare the strength of their handles, the perfection of their welds, the toughness of their straps. Point for point, Wood's top them all.

Then you come to the H. K. Wood's Mo-*lyb*-den-um Steel Shovel. Comparisons cease. Stack a carbon steel shovel up against it and all you get is a contrast.

H. K. Wood's Mo-*lyb*-den-um Steel Shovels are harder, tougher and lighter for a given strength than any shovel made. The difference is overwhelming. They outwear other shovels two to six times. They easily stand abuse no other shovel could survive. Every conceivable test—thousands have been made—proves their absolute shovel supremacy.

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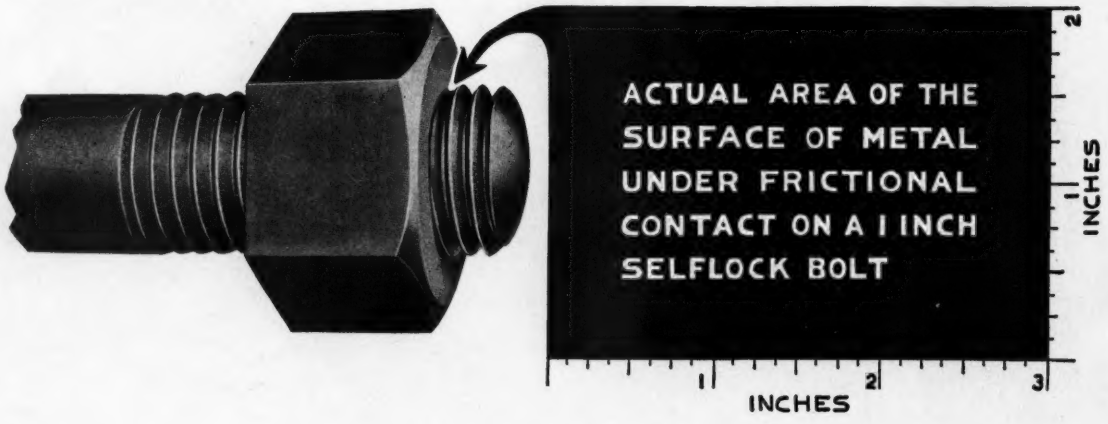
Let us give you complete information about the application of Wood's Shovels to all your needs.

THE WOOD SHOVEL & TOOL COMPANY
Piqua, Ohio, U. S. A.

Wood's Mo-lyb-den-um *The American Super Steel* **Shovels**



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Railway Engineering and Maintenance

Volume 19 December, 1923 No. 12

WHY ARE NOT MORE POWER TOOLS USED?

AN EXAMINATION of the list of tools and equipment suggested for bridge and building and water service forces, which appears elsewhere in this issue, can lead to but one conclusion: practically all of the work done by these forces except the lifting of heavy loads is performed by hand. This does not mean that there is no opportunity for the use of labor-saving equipment; in fact, this idea is refuted in the suggestions offered in the text matter accompanying these tables, which present numerous illustrations of the application of labor-saving equipment. Nor is it the idea to discount the obstacles which militate against the introduction of mechanical equipment for many of the operations performed by the bridge and building or water service forces.

The difficulties are by no means peculiar to railroads. They prevail throughout the entire building field. Nevertheless, the opportunities for improvement are there and there is reason to believe that the obstacles confronting the railroads are not as severe as those which discourage the introduction of better methods and equipment in the building trades in the large cities, where every suggestion designed to reduce the amount of labor required to perform a given piece of work is met by organized opposition. If any criticism is to be offered, it is that too little use has been made of such devices and methods as have proven successful where they have been applied in isolated instances. Admittedly there is room for improvement, so we should see what can be done.

IF TRACK IS WORTH BALLASTING IT IS WORTH KEEPING CLEAN

NO SIGHT is more pleasing to a maintenance man than a newly ballasted track in good line and surface and with neatly dressed shoulders and toe lines. However, such track is more than attractive in appearance. It is an aid to transportation and economical in maintenance. It will continue to possess those qualities, however, only to the extent that it receives adequate attention and without this attention it will deteriorate quickly. One of the principal advantages of an application of new ballast is the drainage it affords. As this is reduced by the fouling of the ballast with dirt and vegetation, it loses its usefulness rapidly. Every effort should, therefore, be made to keep the ballast in proper condition, both by preventing its fouling unnecessarily and also by removing the dirt that collects in the ballast or by applying more ballast at intervals.

Having made the relatively large investment required for the installation of new ballast, particularly of stone, it would seem self-evident that this investment should be conserved by giving it proper attention. Yet it is not unusual for a track to be neglected after it has been given a thorough overhauling with the result that the benefits are of relatively short duration. Within recent weeks an examination of a considerable mileage of track which had been entirely reconstructed and ballasted with stone two or three years ago showed this track to be now overrun with weeds and the drainage therefrom, blocked in large measure, the explanation being that the road did not feel warranted in making the expenditure necessary to destroy these weeds. This position would seem short-sighted and ill-advised for it would appear that if the traffic were of such nature as to warrant the ballasting of this track, it would also warrant the expenditure of sufficient funds for maintenance to keep the weeds out of the ballast and conserve the expenditure which has already been made.

SETTING STAKES FOR TRACK WORK

IN times gone by, the experienced track man lined and raised his track by eye. He was provided with neither line nor grade stakes and he had a disdain for them and for the engineer who set them. However, with the growing necessity for higher and more accurate standards of maintenance, stakes have become a necessity on most roads, both to secure the proper degree of maintenance and to conserve the time of the track forces and the attitude towards them has largely changed.

For these stakes to accomplish the maximum benefit, it is necessary that the engineers who set them work in closest harmony with the roadmaster and his foremen. As the stakes are set to aid the track forces, they should be placed in the manner that will best serve their needs. They should also be set so as to secure the desired standards of maintenance with the least effort. This calls for a high degree of practical common sense combined with technical skill. The engineer who sets curve stakes to throw the track onto the shoulder of an existing embankment in order to obtain a simple curve rather than to compound it is not unknown and does much to discredit his associates in the eyes of his more practical fellow workmen. While progress is necessary in engineering work as well as elsewhere, an engineering party can afford to spend a sufficient amount of time setting the stakes to determine that alinement and that grade which will comply with the standards of maintenance and will, at the same time, reduce the amount of work for the track forces to the minimum for it is generally the case that an additional hour spent in revising a line of stakes will save many hours for the track forces. Care should also be taken to remove all stakes not intended for the guidance of the track forces for many a foreman has become bewildered by reference stakes which have been left after they have served their purpose. Those members of an engineering corps are held most highly in favor by the track forces

and their services are most in demand who have a full appreciation of the part which they can play in facilitating maintenance work.

MUCH WORK CAN BE DONE DURING THE WINTER

WHILE THE summer months are those of the greatest activity in maintenance of way work, the winter season presents a more serious problem for the supervisor in securing the proper output of constructive work from his forces. During the summer the pressure on the various gangs is such that the forces instinctively press for production, but with the closing down of this work with the arrival of cold weather, this pressure is relieved. While it is the prevalent practice to reduce forces at this time, the minimum is fixed by the number required to cope with storms. As a result, the impression prevails in some quarters that these men are not expected to do productive work between storm periods. This is unfortunate and contrary to the best interests of the roads for there is much work which can be done to advantage during the winter and which, when completed, will reduce the peak load of the next summer to that extent.

Responsibility for the preparation and prosecution of a constructive program during the winter months rests primarily with the supervisors and their superior officers. If they will analyze the work which their forces are called upon to perform during the year, they will find much that can be done to almost if not equal advantage during the winter. By incorporating this work in a program for their foremen and then supervising it to see that is carried out, they can secure at least the same degree of efficiency as in the summer. While it is true that weather conditions are frequently adverse and tend to limit production for days at a time, the men which are retained during the winter are more experienced than those which it is necessary to employ more or less temporarily in the summer and their increased efficiency will offset the handicap of weather. Furthermore, with his work at the low ebb the supervisor can give his winter gangs closer supervision and can co-operate with them more fully.

By proper consideration to this problem, maintenance officers can do much to reduce the losses which have occurred on many roads in the past through the inefficient direction of their labor and can at the same time reduce the amount of work which it will be necessary to do next year and thus tend to overcome the handicap of a possible labor shortage. Furthermore, many maintenance officers have long protested against the drastic reduction of forces in the fall on the ground that these forces could be profitably employed during the winter.

WHAT IS MORALE?

Some think of the railroads as the thousands of miles of trackage, of yards and stations, locomotives and cars. I think of them as two million men. Without the lives, the muscles and brains of the men who do the work, whether in the section gang, in the shop, in the cab or in the office, the dollars would not earn one cent of revenue, the tracks would never feel a locomotive, the shareholders and their directors would have nothing of value to own and nothing to direct. The men, because they furnish the energy of the vast machine, and because they are human, largely determine whether the machine runs well or whether it runs badly.

What is morale? In part it is an individual matter. It depends on the good-will and the energy of each man. If every man does his full part, each task is done well and waste is stopped. If the men are careless, indifferent or worried, the machine slows down; its efficiency is impaired and its production is decreased.

But in a complex human organization like a railroad, individual service is not enough. One man may be willing, but surrounding conditions may thwart his good intentions. Another dissatisfied man may lose what the one has gained. A competent locomotive engineer cannot get fuel economy out of a badly maintained engine. A mechanic cannot do a good job if he is not furnished the proper materials. Morale, therefore, lies not only in the spirit of individual service, but also in co-operation.

From an address by William H. Johnston, president of the International Association of Machinists, at a conference of the Transportation Department of the Young Men's Christian Associations at St. Louis, Mo., on November 15.

THE SUPERVISOR MUST SHOW HIS INTEREST

THE ARTICLES appearing in this issue and the one preceding, on the training of section foremen, lay emphasis on the fact that the railroads are expecting more of their foremen than was the case in years gone by. Not only must the foreman have a better education in order that he may keep his records and reports in proper shape, but he must also possess some ability along mechanical lines so that he may maintain and operate the mechanical equipment placed in his hands. That all foremen do not meet the second requirement was made clear in the discussion following the presentation of the paper by J. R. Watt on the operation and maintenance of motor cars before the Maintenance of Way Club of Chicago, an abstract of which appears elsewhere in this issue. Some foremen take excellent care of their motor cars and obtain good results with them from the start. Others, supplied with the same make of car, seem to have no end of trouble, which, as the discussion brought out, arises entirely from a lack of interest, a failure to take care of the car or a wilful reluctance to learn how it should be operated and maintained.

The solution offered by some of the speakers was to deny the use of a motor car to the man who has demonstrated his inability or unwillingness to care for his car in a way that will insure its proper operation. But, Mr. Watt opposed this policy and gave reasons which seem well taken, pointing out that inasmuch as the use of motor cars by section gangs is a practice of demonstrated economy, any gang which is using a hand car when a motor car is available is wasting the company's money. The solution, as he sees it, is not to take the motor car away from the foreman, but to take the foreman away from the motor car, i. e., to remove foremen who cannot operate their cars properly.

In this connection Mr. Watt called attention to another factor in the successful use of motor cars, which is of great importance, namely, that it is the duty of the roadmaster or supervisor to see that his foremen keep their cars in good condition. A number of the railroads are now providing motor car maintainers whose duty it is to inspect the cars and instruct the operators in their proper use and care, but in large measure the work of these mantainers is advisory. They do not exercise the same authority over the section foreman as the roadmaster, and consequently the word of the latter carries much more weight with the foremen. Supervisors and roadmasters as a class have repeatedly demonstrated their interest in the motor car and are continually recommending to their managements that their sections be equipped with this equipment. However, they are remiss in their responsi-

bility if they do not show a sincere interest in the condition of the cars after they have been provided.

THE SUPERVISION OF TOOL EQUIPMENT

MORE THAN half a million men were employed in the maintenance of the tracks and structures of the railways of the United States and Canada at the height of the season which is now drawing to a close, and this number seldom falls below 350,000 men. To enable this large army of men to do their work properly it is necessary for the roads to provide them with a full complement of tools. Because of the diversity of the operations they are called on to perform, these tools vary greatly in character. While the equipment furnished section gangs is more or less standardized, that furnished water service or pumping forces is highly specialized. Furthermore, with the increasing attention which is being given to the development of appliances designed to expedite the performance of specific tasks, this specialization will become more pronounced and the investment in tools will increase correspondingly.

These tools are distributed over practically every mile of the nearly 300,000 miles of railway lines in these countries. Because of the nature of the maintenance of way organization, they must be placed in the charge of more than 60,000 foremen, each of whom is working independently and with limited supervision. The expeditures for this purpose exceed more than $10,000,000 annually. An outlay of this magnitude would appear to warrant close attention. Yet it was evident from the discussion of the report on tool equipment for small gangs at the recent convention of the American Railway Bridge and Building Association at Seattle that the supervision of this investment was characterized largely by its absence. In a few instances it is the practice to require a foreman to turn in an old tool when requesting a new one or to furnish a satisfactory explanation for his request. It is also the practice on some roads to make a check of the equipment of various gangs and to gather up the surplus, but this inspection must of necessity be limited largely to the examination of the tool houses. However, even this more or less superficial check is not made on most roads, with the result that the careless foreman is not detected and the waste continues. Particularly serious is the possibility for large losses at the conclusion of the active working season, when forces are being reduced and the tool requirements correspondingly diminished.

The expenditures for tools are sufficiently large to warrant a railway in developing some simple means of checking their issuance, to insure that the gangs are properly equipped for efficient work and at the same time to prevent loss. The system should not be unduly burdensome, for it would then defeat its purpose, but it should be sufficiently complete to detect losses and to impress employees with the fact that tools represent money and that the roads are interested in the conservation of this investment.

A NEW FREIGHT RECORD.—A new high record in the amount of freight carried by railroads of the United States was made this year by the railroads for the first nine months of the year, according to the Bureau of Railway Economics. The net ton miles for that period amounted to 343,796,799,000, which is an increase of 2.79 per cent, as compared with corresponding period in 1920, when the previous record was made. Compared with the first nine months of 1918, this represents an increase of 4.86 per cent and is an increase of 31 per cent as compared with the corresponding period last year, when freight traffic was affected by the strike.

Letters to the Editor

PLANNING TRACK WORK

Gassaway, W. Va.

To the Editor:

The track foreman who does not plan his work ahead loses a lot of time needlessly. The foreman who knows just where to take up a new job when he finishes another one is the man who gets the greatest amount of work done. The foreman who does not have work planned ahead will often waste a number of hours through not knowing just what to do next, when he could have used these odd hours to telling advantage if he had had his work mapped out.

The foreman should have a plan for at least two or three weeks ahead, showing an allotment of the approximate number of hours that will be required to do each job. He should go over his track and make a thorough study of the work that is to be done and list it, putting the most important work first.

For an example, the program should be made up something like this:

Renew ties curve Mile Post 431, 2 days.
Raise low places just east Miller station, 5 hours.
Replace cracked rail Mile Post 433, 2 hours.
Clean ditches Hurley cut, 4 hours.
Line and surface Paterson passing track, 1 day.
Put in drain boxes Finley slide, 5 hours.
Surface and line track south of Cadiz, 4 hours.
Clean up south end Cadiz Yard, 2 hours.

The foreman will find that if he tries this method for a while he will save considerable time and will generally get his most needed work done first. Also he will never be in doubt as to where to put in a few odd hours. Every track foreman knows that he never runs out of something to do and, in fact, he knows that he never gets everything done, and this is the very reason that he should plan his work ahead. C. H. CARPENTER.

NEW BOOKS

Proceedings of the American Wood Preservers' Association for 1923. 584 pages, 6 in. by 9 in., illustrated. Published by the American Wood Preservers' Association, 1146 Otis building, Chicago.

This book contains the committee reports and papers presented at the nineteenth annual meeting of the American Wood Preservers' Association held at New Orleans, La., on January 23, 24 and 25, 1923. Among the matters of special interest at this meeting were the reports of standing committees on the pressure treatment of poles; preservatives, track service records; paving blocks; the treatment of Douglas fir; inspection; the use of treated materials for car construction and the non-pressure treatment of poles. In addition there were papers on the Lake Pontchartrain trestle; the market for treated lumber; the advance in the art of perforating lumber to expedite treatment; and the current status of the timber preservation industry, in addition to several papers on the more intricate and technical phases of preservation.

As in previous issues of these proceedings, 33 pages of the text contain statistical data prepared by R. K. Helphenstine, Jr., of the United States Forest Service in co-operation with the Wood Preservers' Association. These include data and diagrams on the quantities of ties, piles, poles, etc., subjected to various forms of treatment, figures on the quantities of preservatives used, etc. In the case of ties data are given relative to the quantities of sawed and hewed ties, the number treated with creosote, and with zinc chloride, and the principal woods.

Laying 100-lb. Rail Under Traffic at Rate of a Mile an Hour

Unusual and Interesting Methods Developed by Canadian Pacific Result in Excellent Performance

LAYING rail at the rate of a mile an hour or more under traffic with daily performances as high as 10 miles a day is the result which the Canadian Pacific has been securing on recent work of this nature. During this work 85-lb. rail was replaced by 100-lb. R. E. section on approximately 100 miles of single track main line where there was considerable curvature, by methods for distributing, setting-up, laying and throwing out the old rail which are unique and effective. Steel is unloaded and distributed by a work train with four men to a car, laid by tong gangs handling units of two rails with consistent averages of 40 to 42 seconds per move (20 to 21 seconds per rail laid) or at the rate of approximately 180 rail lengths or slightly over one mile an hour. Old steel is thrown out by a work train with from two to four men assisting. Train service over the line on which the work described here was performed is regular and fairly frequent.

The Canadian Pacific adopted 100-lb. R. E. rail in 1921, when 500 track miles were laid in one location. The road has since followed the practice of renewing by sub-divisions, using the released rail for relaying or for repairs elsewhere on the system. This procedure has allowed considerable leeway in organizing the work to the best advantage, depending upon such factors as location, density of traffic, single or double track, etc. The work described in this article covers the laying of 100.5 miles on one single track sub-division as a part of a program of 500 miles.

Roller Hooks Were Utilized for Unloading Rail

The preparation for this work, which was carried out under traffic, was thorough and complete. Rail was received on flat cars, which carried an average of 60 to 80 rails, and was distributed well in advance of the working forces. Where the ballast shoulder was broad and there was no danger of the rail rolling off the embankment or into deep ditches, it was simply rolled over the side of the car. When the shoulder was narrow or when it was desired to drop the new rail close to the ends of the ties, special roller hooks were utilized. These hooks are made in two sizes, a short one and a long one and are suspended from the stake pockets on the sides of the car. Each contains a large roller upon which the rail is supported as it is unloaded. Ordinarily only one hook was used, the use of the two being restricted usually to high fills and over bridges and trestles. With one hook in place (the short one) the rail is tipped over the side of the flat car onto the short hook which is located slightly in advance of the center of the rail. One end of the rail thus falls easily to the track and as the train moves ahead, the rail rolls along on the roller until it comes to its end and then drops straight down. This short, straight drop with no side throw or rolling movement keeps the rail close to the end of the ties.

When both hooks are utilized the falling end of the rail drops into the roller of the longer and lower hook, where the full length of the rail is supported for a moment along the side of the car in both hooks, after which it rolls out along the line of the train and with but little drop. The result is that the unloaded steel falls without jar, remains close to the end of the ties for its full length and is evenly distributed. This plan is particularly advantageous on bridges and trestles, where the steel is distributed uniformly, safely and rapidly on the bridge deck without the necessity of any men other than those on the work train. In a recent observation of this work the train moved along steadily at a speed of about three to four miles an hour over two successive narrow and high trestles, leaving the new steel properly distributed on each side and with no damage to the steel or the bridge decking.

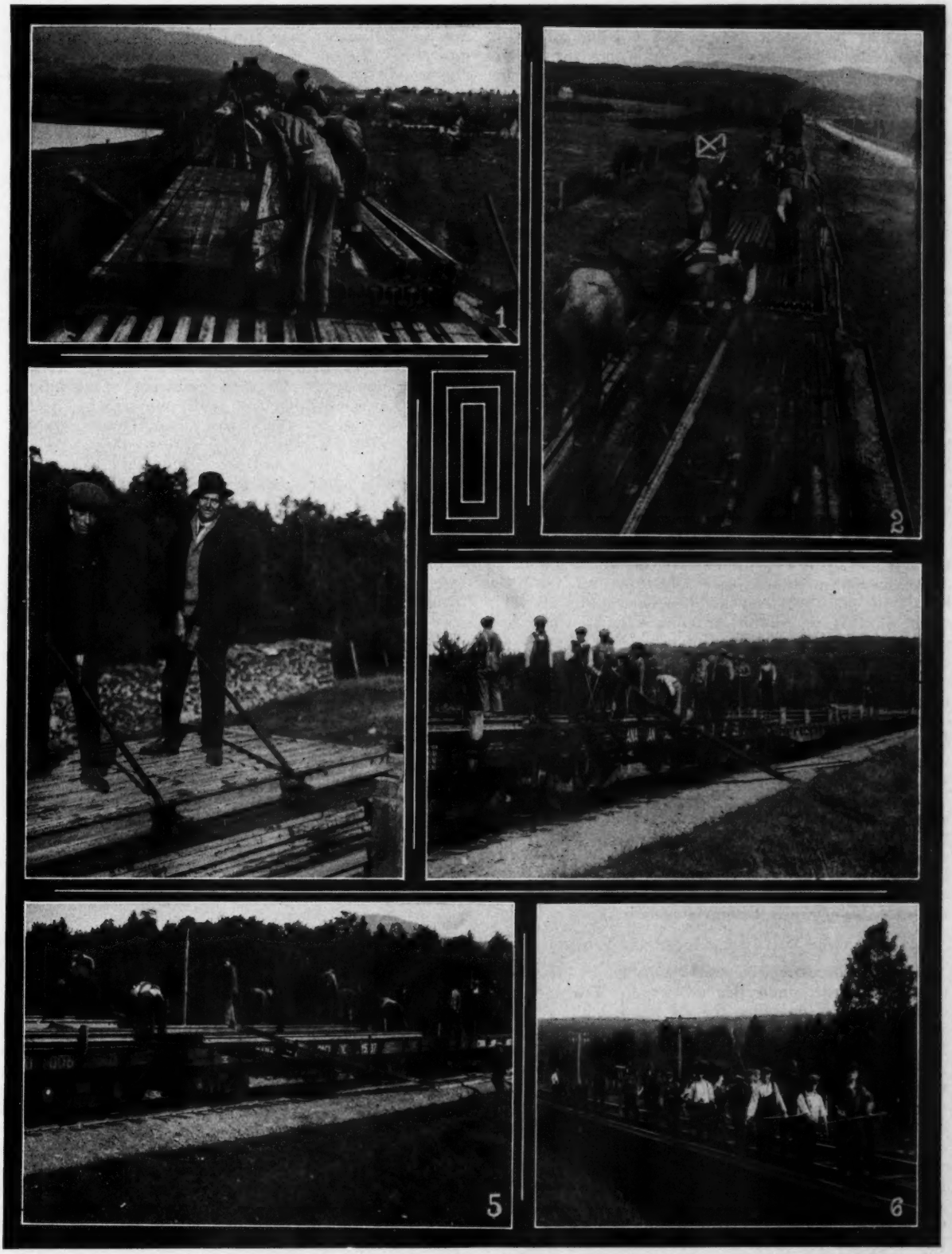
The organization for the distribution consists ordinarily of four men to a car and from two to seven cars are unloaded at a time, according to the location and the traffic conditions. With the latter number three cars are unloaded on each side, each car taking every third rail and the odd car filling in misses, dropping extra steel for crossings, switches, etc. The train speed is about three to four miles an hour on the average, with a daily output varying from 30 to 70 cars a day on level track in open country to 25 to 30 cars a day in more rugged country.

Special Bar Reduces Number of Men

Due to the use of a special type of bar developed on the Canadian Pacific by an extra gang foreman it is possible for four men to handle the unloading of one car at a rapid rate and without particular effort. This bar is in reality a small, light weight "dolly" with projections to catch under the head of the rail from either side. It is also equipped with a clamp for picking up rails by the ball although this is seldom used except on light rails. A jaw located in the base of the roller bar permits turning the rail by engaging the jaw with the base of the rail. By means of this bar two men can roll a rail across the width of a car quickly and with little physical effort. The organization of four men on a car consists of two men on roller bars, one man with a lining bar to help break the rail loose and to steady it across to the edge of the car, and a fourth man equipped with a rail fork to turn the rail over the side of the car or onto the hooks as the case may be. Two extra men with roller bars are needed to expedite work on territory with heavy curves on acount of the superelevation of the track. Thus a complete rail unloading gang handling seven cars consists of the following in charge of a foreman:

Total Men	Duty	Men Per Car
14	Handling unloading bars	2
7	Assistant on center of rail	1
7	Rail fork turning over rail	1
1	Knocking out stakes on side of car	..
1	Emergency man on ground	..
1	Water boy	..
1	Cook	..
32		4

With this organization a minimum of 30 cars per day of 6 actual working hours is maintained regularly. An interesting sidelight on this method of unloading by the use of roller bars is the absence of personal injuries to the workmen. For example, about 800 miles of rail has been distributed with this method since 1921, without the slightest injury to any of the men employed.



Special Devices Facilitate the Unloading of the Rail

(1) Unloading with roller bars on a high fill. (2) The way the roller bars are usually used. (3) Unloading bars with and without the clamp used for picking up light rail. (4) Unloading steel with the short roller hook only. (5) Unloading steel with the two roller hooks. (6) Spike pulling gangs moving ahead. Note rail units in the foreground.

As stated before, the preparation for laying rail is thorough, the work of laying under traffic being confined to the fewest possible number of individual tasks in order that it may proceed at the greatest possible rate with minimum disturbance from and to train movements. In this particular work the rail, after unloading, was set up end to end on the ballast shoulder at the ends of the ties, due care being taken to see that the joints fell in the proper location. This phase of the preparation was greatly facilitated by the use of a number of Three-Man rail layers with which the rail was picked up and set on its base in the proper location. In order to speed up the work and to secure a large mileage per day, two machines were used with 12 men to a machine, enabling five to six miles of rail to be set up each working day. Where the ballast shoulder was not entirely full or where the roadbed was springy, the rail was turned on its side with the ball toward the track and was turned back on its base in advance of the rail laying gangs.

The next step in the preparation of the track was the pulling of the extra inside spikes on curves in order that the spiking on tangents and curves would be uniform. This latter procedure insured uniform movement of the spike pulling gang when the work was under way. Joint bolts at switches, crossings and intervals of 15 to 30 rail lengths on curves were removed, oiled and the nuts replaced with two or three lock washers to facilitate their easy removal. All track remained fully spiked on the outside of the rails.

The method of laying rail was to bar the old rail in towards the center of the track, leaving the tie-plates and outer spikes still in place. The new rail was then lifted into place and spiked down against the shoulder of the old tie-plate. This insured that the alinement and surface of the track remained undisturbed, while a lesser concentration of men was needed and a greater output of work per day was secured. The new tie-plates were inserted later under traffic by extra section forces and extra gangs who adzed ties, plugged the old spike holes and fully spiked the track throughout. Switches were not changed out by the rail laying gangs, owing to the fact that they were not received in time, but were handled later by a special switch gang. It is pertinent to mention in connection with the tie-plating that the Canadian Pacific uses soft wood jack pine and hemlock ties in which spikes can be driven or withdrawn easily. The slight extra labor of driving temporary spikes is thus overshadowed by the lessened delay in laying rail and by the non-disturbance of the track alinement and surface.

Double Rail Units Speed Up Work

In actual operation, the work proceeded in the following general order under flag protection. Two men preceded the gangs, unbolting the old rail at highway crossings and on curves, etc. These men were followed by two gangs, one to each rail, pulling the spikes on the inside of the rail. These were followed by two gangs who barred in the old rail towards the center of the track. This brought the operation up to the actual laying of the new rail and the method which has greatly increased the mileage laid per day. Double-size tong gangs were used on each line of rail, about 36 men or 18 tongs being the usual number to a rail unit. A rail unit consisted of two rails bolted together in advance, making a 66 ft. length as a maximum to handle. With a foreman in charge, the double rail unit was lifted by the tong men and set over on the old tie-plates, at the same time swinging it back against an expansion shim of the proper thickness. The tong men then moved ahead to the next setup, the entire rail laying operation being built around the rate of speed at which they could work steadily.

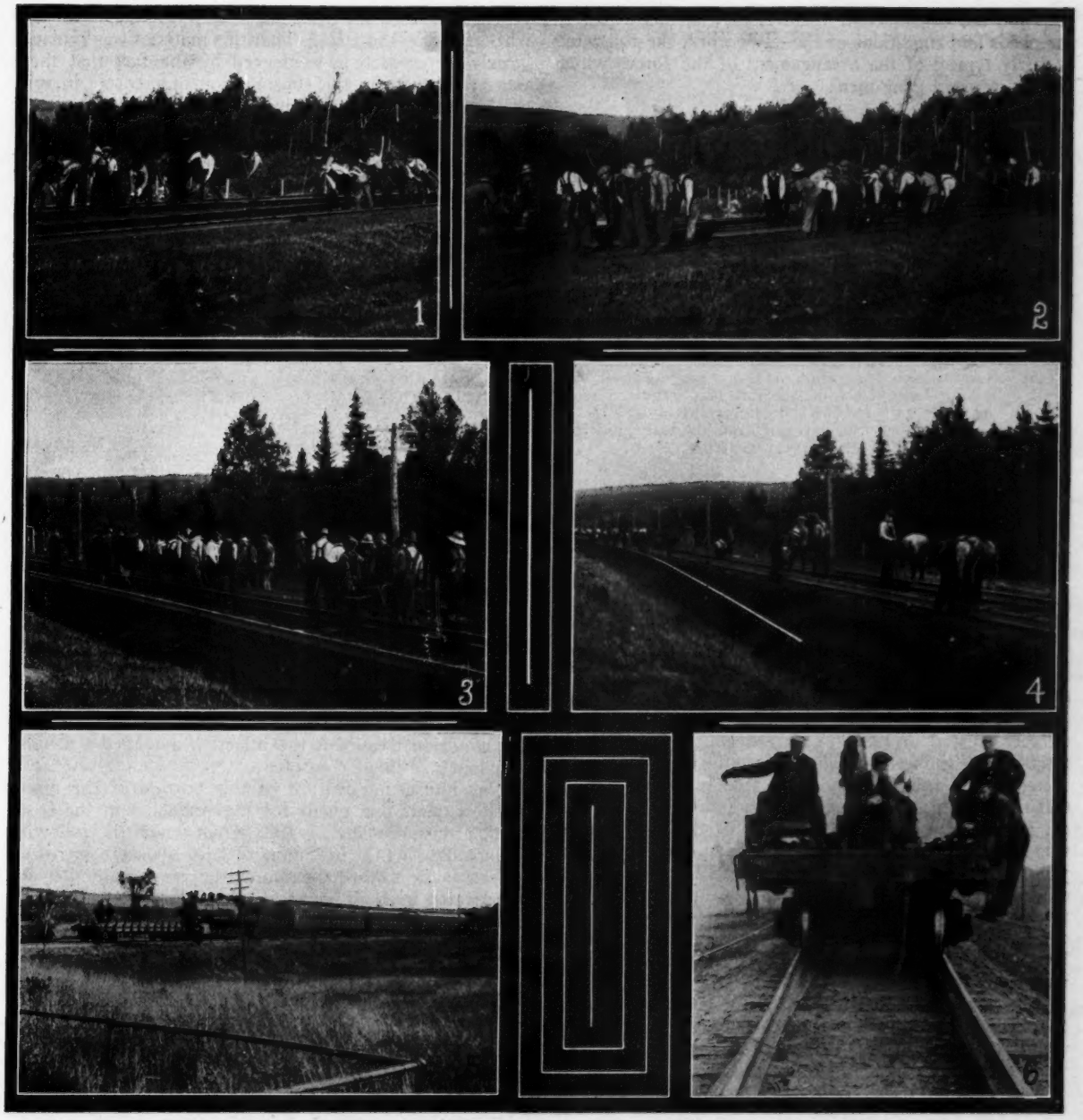
The results of this method have shown that most of the time lost with tong gangs is in starting and stopping them and that the tong men become tired quickly from carrying rail rather than from merely lifting it sideways into place. Bolting the two rails together resulted in a double unit still small enough to handle easily and cut the starting-stopping time in half. Careful preparation in the setting up of the new steel practically obviated the carrying of it more than a foot or two at the most. Ordinarily little delay is found if the carrying is done ahead, but the loss is multiplied if it becomes necessary to back up or fill a gap of any size. At this point it is worth noting that rather than have the tong men carry a unit four or five feet, a small amount for one set-in but amounting to a considerable distance when continued over a long stretch of track, thus slowing up the work and tiring the men unduly, the organization will throw in short rails or even cut a rail in order to get the joints back even again.

The effect of this plan has been that the tong gangs have been able to maintain practically the same average pace throughout the day with surprisingly little fatigue. Timed at various hours from early morning to late afternoon, over stretches of from 10 to 20 rail lengths, it was found that the tong gangs were traveling at the rate of about 40 to 42 seconds per move or at the rate of 3 rail lengths a minute or 180 rail lengths an hour. That this was done more or less easily was evidenced by the fact that when speeded up each tong gang has maintained a pace for short periods of time of one move each 20 seconds or at the rate of about 360 rail lengths an hour. During a good day where physical conditions were better than the average for this territory a track mile of rail was set in in 28 minutes more than once during the day and a little over 10 track miles was laid during the day.

The tong gangs were followed by two gangs, one to each rail, equipped with lining bars and spike mauls who barred the new rail over tight against the shoulder of the old plates and spiked it down on the inside of the rail by driving spikes on alternate ties just outside of the tie-plates. Several men with adzes worked in and around the tong and spiking gangs to take care of new joint ties, etc. The bolters followed behind these gangs, putting on the remaining alternate joints and pulling them up tight, leaving all joints fully bolted. A small gang followed in the rear, checking up the work and insuring that the track was ready for traffic. The day's run was not considered complete, however, until the old rail had been thrown outside of the new steel and for this purpose, a work train and from two to four men were used in a novel manner.

Work Train Throws Out Old Rail

The arrangement now in use is similar to that shown in one of the illustrations. With this method the loose ends of both old rails were lifted over the new steel with a pair of tongs and lining bars after which a work train, which was assigned regularly to the rail laying gangs, was moved along the track at a speed of from three to five miles an hour, pushing in front of it a flat car loaded with short length rail, miscellaneous extra tools, etc. The tread of the leading wheels on the first truck gradually pushed the old rail over and outside the new, leaving it on the end of the ties. For lubricating purposes, oil soaked waste was supported over each wheel by a wire by which the waste could be raised out of the way when not in use. Using the work train in this fashion, the old rail was thrown out smoothly and quickly and with practically no attention other than maintaining a steady pace. In general, five miles an hour seemed to be about



How the Rail Was Laid

(1) Barring in the old rail. (2) The tong men are not crowded when picking up a two-rail unit. (3) The tong gangs swing in the new rail by units of two rails. (4) Bolting up the remaining joints. (5) The work train unit which is assigned to the rail laying gangs. (6) Flat car and work train throwing out both old rails at one time.

the most satisfactory speed with rail bolted up with angle bars. Where base supported joints are used, a number of men, usually two to a rail, equipped with light bars, gave the lower corner of the joint a slight upward spring as it approached the ball of the new rail, causing it to ride up and over the rail without catching. Under both conditions rail is thrown out at rates adjusted to suit the work, easily keeping up with the progress of the rail laying gangs, although only working during odd hours to fill out the day when it would otherwise be idle in a siding. It is estimated that the use of a work train for this purpose replaced from 30 to 50 men, at least, based on previous experience where 30 men were needed to keep up with gangs laying five miles a day.

When necessary to close the track, special 11-ft., 100-lb., 85-lb. switch points were used. In laying the new steel allowance was made for creeping by opening up the joints at the foot of grades, approaching water tanks, etc., and blocking it tight at the summits. Rail anchors were applied after rail laying by extra section forces.

The rail laying forces were housed in boarding cars and were taken to and from work in three colonist cars equipped with steam heat and attached to the work train. This materially reduced the possibility of sickness among the men and in addition permitted the utilization of the maximum available working time. Following the completion of the rail laying the gangs were broken up into units of 30 to 50 men to insert the new tie-plates and full-spike the track, inserting an average of from 80 to 100 plates per man per day.

While the organization varies somewhat according to the needs and conditions of the day's work, the following is fairly typical of the arrangement of the forces which consist of extra gang men:

Number of Men	
1	Flagman
6	Three on a side, setting up new rail on its base (when required)
2	Breaking joints
2	With push car, carrying material for closing up track
18	Nine on a side (one foreman) pulling spikes
1	Driving down broken spikes, etc.
16	Eight on a side (one foreman), throwing in old rail (smaller number required on tangent track)
72	36 on a side (two foremen), two tong gangs
3	Pulling spikes around joints of new rail
2	Adzing where required
64	32 on a side (one foreman), bolting up joints
48	24 on a side (one foreman), spiking new rail
1	Spiking loose ends of old rail (not required when work train follows gangs closely)
10	One foreman. Special gang on highway crossings and cutting closures at switches, etc.
4	Checking up new work
3	Helpers on work train throwing out rail (five men needed on curves where rail is broken often)
3	Carrying water
1	Flagman
257	Total

Statistics for 1922 Show Decrease in Timber Treated

THE number of cross ties treated in 1922 was 41,316,474, a decrease of 14,067,041, as compared with the number treated in 1921. This reflects the trend in the treatment of timber, as a whole, since the number of cubic feet of wood for all purposes treated in 1922 was 166,620,347 cu. ft. as compared with a total of 201,643,228 cu. ft. in the previous year, in spite of the fact that 128 wood preserving plants were in operation during the latter year as compared with 122 plants in 1921. These, and other interesting facts concerning the operations of the timber preserving industry, have been taken from the annual statistics prepared by the Forest Service of the United States Department of Agriculture, in cooperation with the American Wood Preservers Association.

That the general reduction in the volume of timber treated is primarily a consequence of the reduced demands for treated ties is evidenced by the fact that there were actual increases in the quantities of treated piles,

CUBIC FEET OF TIMBER OF VARIOUS CLASSES TREATED IN 1921 AND 1922

Classes—	1921	1922
Crossties	166,150,545	123,949,422
Piles	5,581,999	7,496,789
Poles	10,959,256	17,008,640
Wood blocks	6,202,904	3,947,551
Cross arms	108,715	374,829
Construction timber	11,876,708	12,713,080
Miscellaneous lumber	753,101	1,130,036
Total material treated	201,643,228	166,620,347

poles, crossarms, construction timbers and miscellaneous materials. In only one other general class of forest products was there a decrease in the output, namely: wood blocks, in which the volume treated in 1922 was 3,947,551 cu. ft., as compared with 6,202,904 cu. ft. in 1921. The greatest increase in the use of treated material occurred in poles, 17,008,640 cu. ft. of which were treated in 1922, as compared with 10,959,256 cu. ft. the year before, or an increase of nearly 65 per cent.

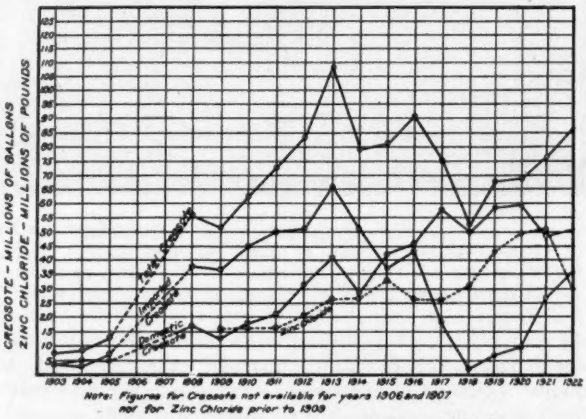
One of the most interesting features of the statistics relates to the figures on the consumption of preservatives. These show that there has been a marked decrease in the use of zinc chloride as compared with the previous year, only 29,868,639 lbs. being used in 1922, as compared with 51,375,360 in 1921. That this material was replaced largely by creosote is evidenced by the fact that there was an increase in the consumption of creosote in spite of the marked reduction in the total volume of timber treated. Creosote to the amount of 86,321,389 gal. was used in 1922, as compared with 76,513,279 gal. in 1921. This increased supply came largely from abroad, 35,462,238 gal. of creosote being imported and 50,859,151 gal. produced in the United States in 1922, representing increases of 7,219,931 gal., and 2,588,179 gal., respectively.

Detailed figures on the treatment of crossties show that of the total number of ties treated, creosote was used for 20,208,362, and zinc chloride was used for 17,418,101. In addition, 3,681,971 received the zinc-creosote emulsion, and 8,040 were subjected to impregnation by miscellaneous preservatives. Where the treatment was by creosote alone the average injection was 6.59 lb. per cu. ft. In the case of zinc chloride it was 0.5 lb., while with the emulsion treatment the injection averaged 0.5 lb. of zinc and 2.74 lb. of creosote.

WOOD PRESERVATION 1909-1922, TOGETHER WITH CONSUMPTION OF CREOSOTE AND ZINC CHLORIDE

Year—	Total Material Treated Cubic Feet	Number of Cross Ties Treated	Creosoted Used Gallons	Zinc Chloride Used Pounds
1909	75,946,419	20,693,012	51,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,888	40,260,416	108,378,359	26,466,803
1914	159,582,639	43,846,987	79,334,606	27,212,259
1915	140,858,963	37,085,585	80,859,442	33,269,604
1916	150,522,982	37,469,368	90,404,749	26,746,577
1917	137,338,586	33,459,470	75,541,737	26,444,689
1918	122,612,890	30,609,209	52,776,386	31,101,111
1919	146,060,994	37,567,927	65,556,247	43,483,134
1920	173,309,505	44,987,532	68,757,508	49,717,929
1921	201,643,228	55,383,515	76,513,279	51,375,360
1922	166,620,347	41,316,474	86,321,389	29,868,639

One interesting feature of this portion of the report is the explanation given for the reduction in the treatment of crossties during 1922, from which the following is quoted: "At the beginning of 1920 ties were extremely scarce, while toward the end of the year production was accelerated by high prices, resulting in overstocks which lasted through 1921 and well into 1922. These over-



Consumption of Creosote and Zinc Chloride

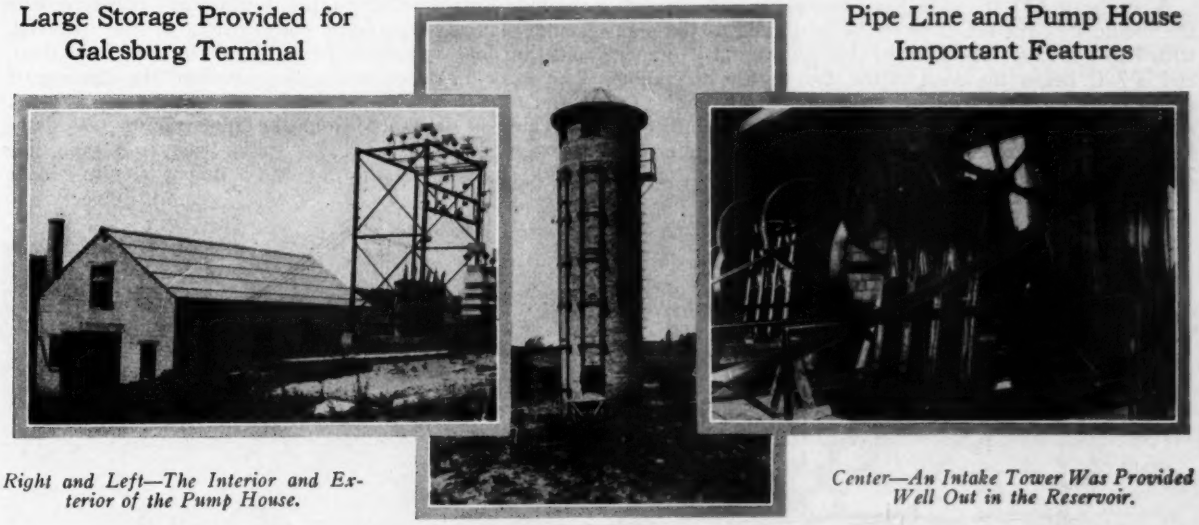
stocks of ties, which were purchased and treated in 1920 and 1921 and used as late as 1922, naturally influenced the treatment of ties in 1922 and probably account for the decreased number of ties that were subjected to treatment during that year."

Of the total number of ties treated 25,627,476 were hewed and 15,688,998 were sawed. One of the tables given in the report shows that of the ties treated during 1922, the leading species is oak, with a total of 16,900,310 ties; and the second is yellow pine with 9,551,664.

Burlington Builds 900,000,000-Gal. Reservoir

Large Storage Provided for Galesburg Terminal

Pipe Line and Pump House Important Features



Right and Left—The Interior and Exterior of the Pump House.

Center—An Intake Tower Was Provided Well Out in the Reservoir.

WHAT is believed to be one of the largest reservoirs ever built for railroad water storage has recently been completed by the Chicago, Burlington & Quincy at Galesburg, Ill., to supply water for locomotive use at the extensive terminals at that place. The reservoir has a storage capacity of 900,000,000 gal. and is equipped with pumping machinery capable of delivering 3,240,000 gal. of water in 24 hours through a pipe line nearly six miles long. This water supply project was undertaken to provide more adequately for the requirements of the large and growing terminal at Galesburg.

Galesburg is the most important terminal on the system, lines diverging to Chicago, Peoria, St. Louis, Kansas City, Omaha and St. Paul. It is the principal point of distribution for the large coal traffic from the southern Illinois fields. An idea of the burden imposed on the water service at this point is gathered from the fact that the average number of locomotives handled at the terminal daily during 1922 was 97, that the average number of passenger trains in and out was 62, and the average number of freight trains was 117.

Until the completion of the new project, the Galesburg terminal has obtained its water supply from Rice lake, an artificial reservoir of 300,000,000 gal. capacity, and a smaller reservoir at Hylands, with a capacity of 50,000,000 gal., these supplies being supplemented by a connection with the city water system of Galesburg, although this is provided only for emergency service since the city water, being derived from deep wells, is too hard to be desirable for boiler purposes.

At the same time that the Rice lake supply was developed in 1901, a pumping installation capable of delivering 500,000 gal. of water per day was entirely adequate, but the present requirements range from 1,500,000 to 2,000,000 gal. per day, with the result that periods of dry weather have required the hauling of water from Gladstone, 33 miles west, at a heavy expense.

The new reservoir is located some six miles south of the terminal, where the natural drainage has cut a network of ravines to a depth of over 50 ft. below the general level of the surrounding territory and where a dam crossing the main valley has resulted in the impounding of water from a drainage area of approximately 7,000 acres. The reservoir thus formed is of a decidedly irregular outline, nowhere over 700 or 800 ft. in width, but having a length of about two miles in a straight line in the greatest dimension. The land which the railroad was required to purchase in order to encompass the entire area to be submerged totals approximately 1,000 acres, much of which is covered with a fine growth of hardwood timber, thereby giving this reservoir surroundings which will make it an artificial lake of genuine beauty.

Dam Has Core of Creosoted Plank

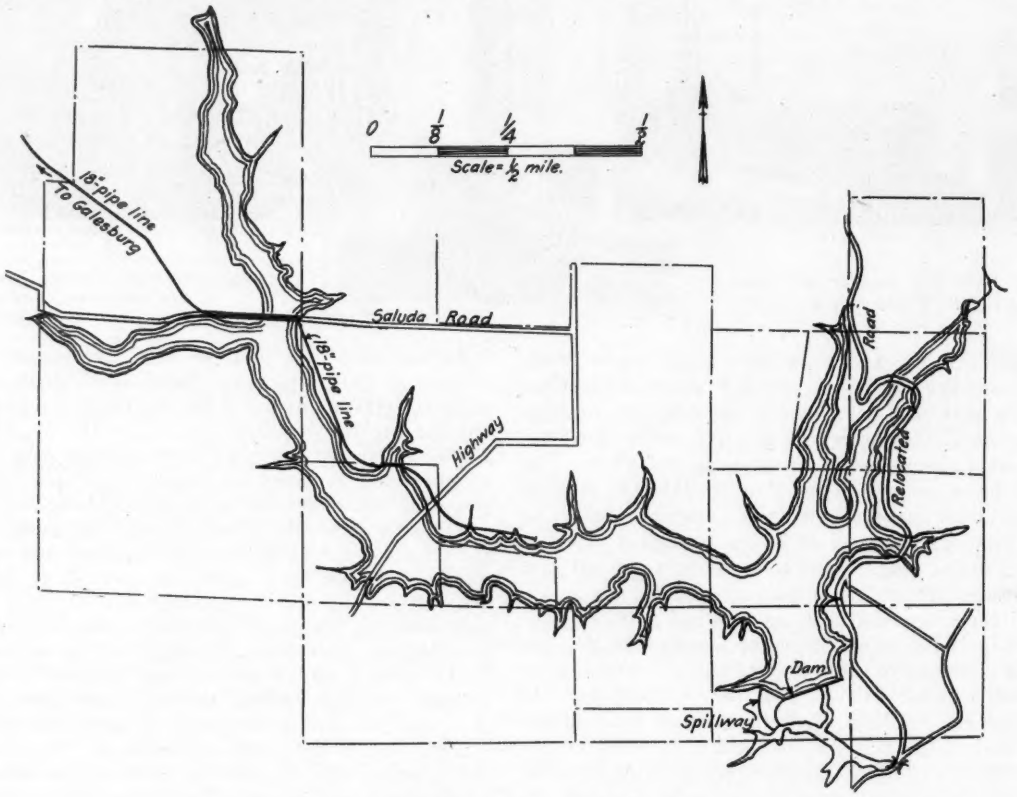
The dam has a length of 700 ft. and a height of 48 ft. above the bed of the creek. The upstream face has a slope of 3 to 1 and the lower face 2 to 1. It is built entirely of earth, totaling 74,000 cu. yd. with a core wall of 2-in by 12-in creosoted plank in the center to stop rodents and crawfish. The planks are laid crosswise on

The Dam and Spillway at the Reservoir

2-in. by 12-in studding spaced 8 ft. center to center. The upper side of the dam is covered with a layer of rip rap 1 ft. thick for a width of 20 ft.

A spillway 220 ft. wide has been excavated through the shoulder of the hill close to the south end of the dam with 1 to 1 slopes. The floor of this spillway at its upper end is 7 ft. below the crest of the dam with a decending grade of 5 to 6 per cent toward the outfall end. To insure against erosion of the spillway, with the effect of lowering the water level in the reservoir, a concrete wall 7 ft. deep and 18 in. wide was constructed across the material being wasted. With this exception all excavation was done with elevating graders and wagons. All material in the dam was put down in one-foot lifts, sloping downward from the south end; one-foot lifts being required to assure compactness of the material, and the slope was made to facilitate closing of the dam. The work on the reservoir also involved the clearing of about 60 acres of timber land within the reservoir area.

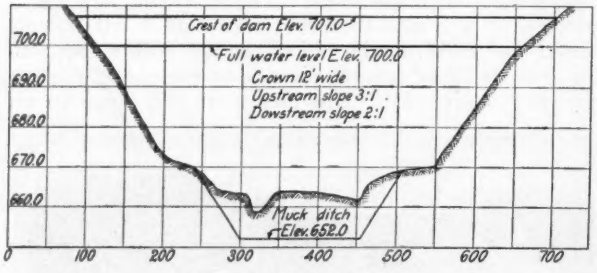
Water is delivered from the reservoir to Galesburg through a 16-in. bell and spigot cast iron pipe line 17,800 ft. long to the railroad's timber treating plant



The Reservoir Spreads Over a Large Area

base of the spillway at the upper end and for a short distance up each slope, with the finished top flush with the neat excavation.

The dam was built with material excavated from the spillway and about 10,000 cu. yd. in addition from borrow



Profile of the Dam

and from a cut required for a highway relocation close by. The material is a clay loam. Before placing any of the fill the site of the dam was cleared and grubbed and all sod removed. In addition a muck ditch 10 to 15 ft. wide involving 700 cu. yd. of excavation was taken out on the center line of the dam with a drag-line excavator, the

located at the end of the terminal closest to the reservoir. There booster pumps relay the water through the existing mains to various parts of the terminal. The pipe line from the pump house to the timber treating plant was laid with a continuous fall in the direction of the pump house, a requirement which entailed trenching to depths of as much as 15 ft. in some places. Pressure gages and air releasing valves are provided at eight different points along the line.

The pump house is a concrete block building with concrete tile roof and metal sash windows 55 ft. by 31 ft. in plan, and with a reinforced concrete floor over a basement. The pumping equipment comprises three independent units, each consisting of a triplex pump furnished by the Pratt Works, Dayton, Ohio, with a capacity of 750 gal. per min., belt driven from a 240-volt, 3-phase, 60 cycle alternating current electric motor supplied by the General Electric Company. Current is delivered to the plant at 16,500 volts over a transmission line designed for 33,000 volts, being stepped down to 440 volts in transformers located adjacent to the pump house. Each of the three units is provided with duplicate independent controlling equipment, a Cutler-Hammer manual controller, and an automatic controller supplied by the In-

dustrial Controller Works, Milwaukee, Wis. It is intended to operate at the plant with manual control for two 12-hour shifts daily, until the reservoir fills to a level that will insure practical operation with automatic pressure control.

A Brick Intake Tower

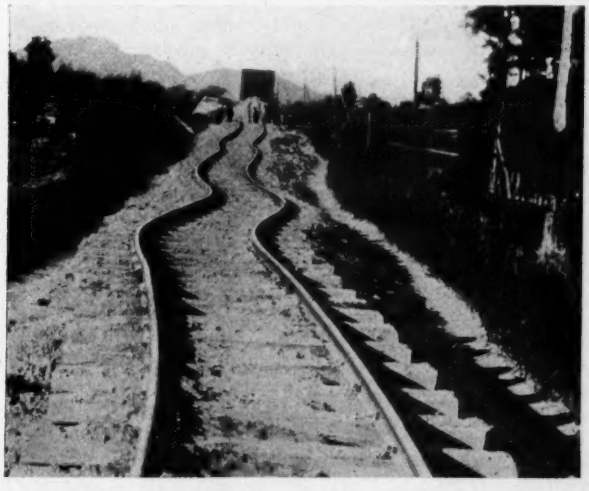
Water is delivered to the plant through a 20-in. suction line from an intake tower located well out in the reservoir. This tower is 8 ft. in diameter, with a 13-in. brick wall and composition roof. It is provided with three in-

The Spillway Was Excavated by Team Work

takes 20 in. wide by 36 in. high, covered with No. 8 gage bronze screen. These gates are spaced 10 ft. center to center vertically so as to provide for the intake of water at the desired elevation and are controlled by geared floor stands installed at the top of the tower on a concrete floor 4 ft. above the full reservoir water level.

Owing to the large area covered by the reservoir, several of the arms or bays following the various ravines cross public highways, making it necessary to undertake rather elaborate provision for highway relocations bordering the reservoir for considerable distances, which involved a considerable additional expenditure both for grading and for bridge and culvert construction.

The reservoir project at Galesburg was carried out under the direction of A. W. Newton, chief engineer, C. L. Persons, assistant chief engineer, and W. T. Krausch, engineer of buildings, with A. E. Smith, division engineer, in immediate charge.



Gilliams Service, New York.

What the Earthquake Did to Some Japanese Track

Renewing 98 Bridge Spans Without Disturbing Traffic

THE NEW YORK CENTRAL has recently completed the renewal of a 98-span section of its four-track bridge over the Seneca river and the Montezuma swamps, east of Buffalo, N. Y. All steel in the No. 2, or eastbound high speed passenger track, was renewed under a plan of procedure which permitted the work to be carried out at the rate of one 181-ft. span for each 10½ minutes of working time. The actual work of renewal was completed in two days with practically no interference to train operation.

This bridge is a four-track structure with eastbound tracks, known as tracks Nos. 2 and 4, on the outside of the structure, No. 2 being on the south side and used for high speed service, principally passenger traffic. In the middle are the two westbound tracks, known as tracks Nos. 1 and 3, track No. 1 being used for high speed service, and adjacent to track No. 2.

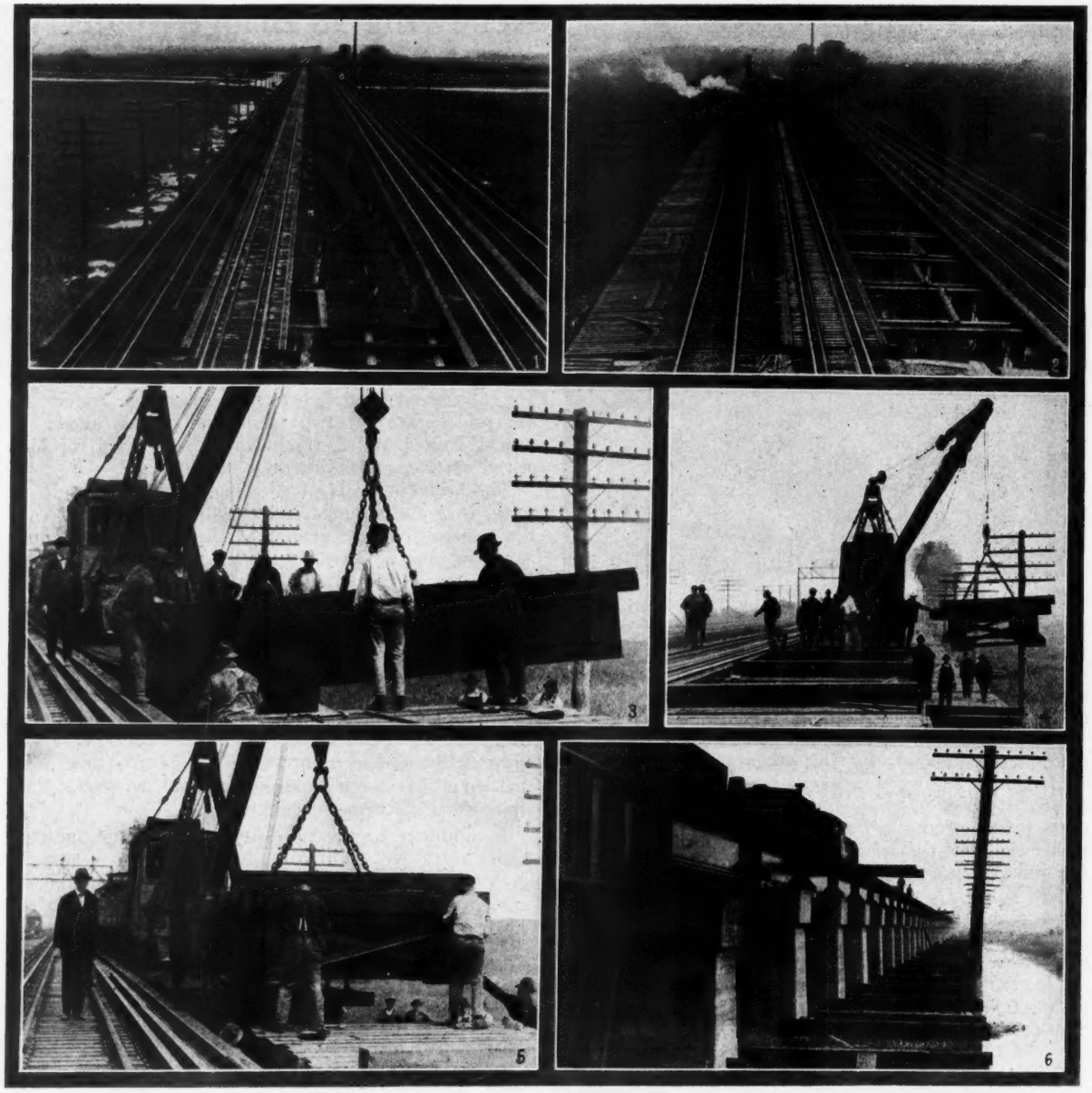
The bridge consists of 97 spans approximately 18 ft. each, over the swamps and one span 35 ft. long over the Seneca river, or a total of about 1,790 ft. There are two lines of concrete piers, one line supporting tracks Nos. 1 and 2, and the other tracks Nos. 3 and 4. The substructure is supported on a mattress resting on a saturated alluvial base.

In view of the great volume of traffic passing over this structure, its length and the fact that a slight change in alinement as well as a variation in the elevation of the deck had to be taken care of, progressive installation of spans was out of the question. The expense and delay occasioned to train operation, due to a slow order that would have been required for about ten weeks' time, made such a scheme prohibitive.

In addition to the necessity of renewing the steel under track No. 2, it was also advisable to renew the deck under track No. 1. This necessity permitted the use of a very novel and effective plan of procedure. The new steel was unloaded on timbers resting on the ends of the piers in the wide space between tracks Nos. 1 and 3, and the deck on track No. 1 was then renewed under traffic, utilizing the new spans thus placed as a temporary platform for the workmen in handling the old and new decks. When this renewal was completed the old bridge ties were transferred to the outside of track No. 2 and utilized for the construction of falsework, to which the new steel was swung by locomotive cranes. The new timber deck was then placed on the new steel.

All this preliminary work was done before any track changes were made and without any interruption to traffic. Track No. 2 was then cut over to track No. 1 at both ends of the bridge, and track No. 1 was then cut over to track No. 3, thus permitting the exclusive use of track No. 2 for erection of steel. No signal protection was necessary, operation being protected by a flagman located at each end of the bridge, all west trains being required to come to a full stop before proceeding.

As soon as track No. 2 had been secured for the use of the forces, the actual work of erection was begun. The first span to be removed and replaced was that of the Seneca river crossing proper, a 35-ft. span for which a steam wrecking crane was utilized. For the remainder of the work a derrick car was used in order that there would be no interference with traffic on the adjacent track when spans were swung in or out. The derrick car operated on the old track, lifting out one of the



Successive Stages in the Bridge Renewal

(1) New deck on Track 1 and old ties distributed on new girders between Tracks 1 and 3 ready for use for cribbing under new spans on the south side of Track 2.
(2) New spans with deck supported on falsework adjacent to Track 2.
(3) Lifting an old span out and turning it crosswise with the track preparatory to loading it from Track 3.
(4) Transferring a new span from falsework into final position.
(5) Lowering into place a new span complete with deck.
(6) New steel spans in place.

old spans at a time, after which it was turned through 90 deg. and then swung down and under tracks Nos. 1 and 2 where it could be easily removed later from track No. 3 and with no interference to the high speed traffic. The new span complete with its new deck was then lifted and swung into place and the rails replaced, after which the crane moved back to the next span and repeated the procedure.

The whole operation of cutting track, taking out the old span, placing the new steel and replacing the rail ready for the next span took 10½ minutes. Forty spans were placed the first day and 58 the second. The total time for placing the 98 spans was 17 hours and 15 minutes. The total weight of steel placed was 494 tons. The small spans with deck weighed about 7 tons each and the larger span about 19 tons with deck. Forty-five bridge men and 50 track men were engaged in the work.

The drilling of anchor bolt holes presented a rather interesting feature, inasmuch as the 784 holes were drilled with a pneumatic hammer equipped with diamond pointed drills. They were drilled at the rate of two minutes for each hole, 12 in. deep, and at a cost of 5 cents per hole. Two men were used. It was estimated this would cost 70 cents per hole by hand operation.

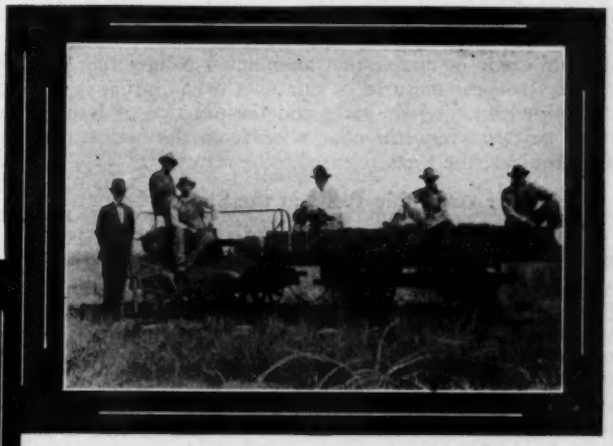
This work was planned by and carried out under the general direction of P. H. Winchester, division engineer; D. L. Robertson, supervisor of track, and G. J. Klumpp, supervisor of bridges and buildings.

Motor Car Repair and Operation Require Supervision*

A Discussion of the Conditions to Be Considernd and How One Road Has Met Them

By R. J. WATT

General Roadmaster, Louisville & Nashville, Louisville, Ky.



BY the very nature of the transportation industry, its work is scattered and the forces required for the upkeep of its plant are widely distributed. It was for the purpose of transporting these forces from place to place and to insure their adequate supervision, that the motor car was developed. At the present time it is generally considered a necessity. When confronted with the problem of its maintenance the managements have usually turned to the mechanical departments, but on the larger railroads I think there is a good reason for the organization of a motor car department under the supervision of the maintenance of way department. If handled by the mechanical department adequate pressure cannot be exerted by those directly interested in the cars to get them out of the shops and the work is therefore delayed for the completion of work that is of greater importance to the mechanical officers.

Maintenance Costs an Important Item

Generally, the cars have not been bought with a view to systematic maintenance. Some were bought by the operators and later taken over by the railroads, others were bought because they were cheap. Both methods have made the maintenance of cars difficult and expensive. Naturally there are objections to going to extremes in the matter of standardization but by confining purchases of cars to a few types, the work will be greatly simplified and when it is considered that the annual expense of operating and maintaining motor cars will run about half the first cost of the car, it is evident that other features besides the first cost of the cars should have careful consideration.

The maintenance organization I will outline has been developed to take care of the cars on the Louisville & Nashville and would, no doubt, require some modifications to suit conditions on other roads. Our railroad did not use motor cars until about six years ago. As a consequence, when we did start to provide cars they were bought at a rather rapid rate, and for this reason we have had an opportunity to confine purchases more definitely to standard makes of cars and to the purchase of complete cars than has been the case with some of the other roads which have been using motor cars for a longer time.

As none of our men had had any experience in the operation of cars, field forces were naturally needed more as instructors than as repairmen and it was with this view that the first maintainers were authorized. Needless to say, when our men were first given motor cars there was much fast running. They did not heed the consequences of recklessness by the other fellow and usually each one of them had to have his experience. Some of them met trains, some ran over dogs, they even had serious head-on collisions among themselves in spite of the fact that rigid instructions had been issued limiting the speed and calling attention to all these dangers, which we knew well had caused the same trouble on other railroads.

Therefore, we soon saw the need of a motor car supervisor and several maintainers located to the best advantage over the system. We also started a central shop with a foreman, mechanics and a clerk. A storeroom was provided at this shop and an effort was made to stock such repair parts as would be needed to protect the cars in service. Naturally our first efforts resulted in providing more of certain parts than were needed and not enough of other parts. It has required several years experience to form an idea as to what parts should be carried and in what quantity, but even now we have difficulty and will have an unexpected run on certain parts which later slackens and is superseded by an abnormal issue of some other parts.

This matter of stock is of prime importance in the maintenance of motor cars. Usually the railroads do not provide more cars than are needed and when a car is out of service the company is losing money. Unless other roads have provided cars more liberally than we have, it is not possible to have surplus cars to ship out promptly to replace cars out of service.

Motor car parts, like the repair parts for other machinery, are necessarily expensive and it is desirable not

*Abstracted from a paper presented before the Maintenance of Way Club of Chicago on November 14.

to carry any larger stock than is absolutely necessary. In our own case, I found that in 1922 the repair parts issued for 680 cars of all classes amounted to $31,500, or about 1.2 cents per mile operated. In order to furnish parts promptly on request and take care of the shop requirements, the stock ran about $25,000. Naturally if this stock was provided at more than one point and left to the supervision of a department not so vitally interested, it could easily be double that amount. I believe that one of the strongest features of our own organization is the central stock of repair parts and the practice of issuing these parts on requisition or wire from the maintainer, and requiring the parts released to be returned.

Assemble Parts in the Shop

Another feature is the practice of issuing repair parts whenever possible in units assembled at the shop and arranged so that they may be readily installed by the maintainer in the field, I refer particularly to motors, transmissions, timers and other assemblies which may be overhauled to better advantage in the shop where there is every facility for doing the work. On larger railroad systems it would probably be necessary to modify this plan to some extent on account of the greater length of time required to get repair parts to their destination. We are usually able to accomplish this with parts which can be delivered by baggage car in about 24 hours.

For the 800 cars which we are now operating, we are employing 10 maintainers. However, in addition to motor cars we are gradually taking over tie tampers, bonding outfits and other gasoline-driven machines. For this reason our force of maintainers is hardly as large at this time as it should be to enable them to cover their territories to advantage. The districts are arranged and the maintainers located with a special view to convenient train service and to the distribution of the cars. The division officers are necessarily given the direct supervision of the maintainers who also report to the motor car supervisor on certain matters, and are subject to his instructions whenever desirable. They carry a limited stock of such small parts as they are likely to need but we make an effort to keep this stock at a minimum and issue parts to them by passenger train. If they can ascertain what parts they are likely to need on a certain car, they provide these parts before making the trip to a car.

The Qualifications of a Maintainer

It is not easy to procure men who make successful maintainers. They should be mechanics, but above all they should be capable of instructing the operators and of encouraging them to make certain running repairs on their cars. They should be capable of planning their work to the best advantage and be of a type who can be depended upon to do their best without much supervision. They must be resourceful, for they have many things to accomplish with few tools. They have to keep the car in service until it can be overhauled or until they can procure the parts to make more permanent repairs. It is, therefore, apparent that to procure mechanics who have such qualifications is not an easy matter.

In the training of maintainers, I have found that the manufacturers can render much valuable assistance. They all have service men and are usually glad to send them out to cooperate with the railroads using their cars. These men are experts in their line and can always offer suggestions on matters which the maintainers would otherwise have to work out for themselves. Where railroads have standardized largely on certain makes of equipment, the factory is a good training school for the maintainer.

The operator should be taught to keep his car clean and the bolts tight. He should turn the car up on end occasionally and tighten the axle box bolts and go over the car thoroughly. He should use plenty of oil and clean grease. The grease cups should be full and the grease should be carried in containers that will not accumulate grit and dirt. Our experience in the shop has been that a large part of the work being done in made necessary by lack of lubrication.

The maintainer should also make sure that the operator is using the proper grade of oil and the right amount. So far we have been successful in limiting purchases of lubricating oils to one standard brand, of which it is necessary to carry two grades. As long as this can be done consistently, it is a great advantage. The operators become accustomed to the grade of oil to be used and can usually detect any change or error by storekeepers in issuing the wrong grade of oil. If more than one brand of oil is used, there will soon be such confusion of grades that the operators will be at a loss to determine whether they are getting the right grade of oil or not. Each manufacturer has determined the grade of oil which his engine should have and it is on proper lubrication that the success of the motor car operation very largely depends.

What Does It Cost?

The question naturally arises as to the cost of operation under the arrangement outlined. We have probably not broken any records in this respect for whenever cars are overhauled in the shop, we have made an effort to replace every part that does not appear capable of giving reasonable service. Naturally some bushings and other parts are replaced which might give further service, but in order to insure that the car will stay out of the shop we usually replace such parts. In 1922, we operated 680 cars with a reported mileage of 2,633,000 miles, at an approximate cost of 4.8 cents per mile. This cost may be divided into four practically equal parts, as follows:

1. Shop and road supervision.
2. Repair parts.
3. Supplies, such as oil and gasoline, batteries, etc.
4. Interest and depreciation.

Each of these items amounted to about 1.2 cents per mile. The shop and material costs include not only parts supplied by the road men, but parts used in rebuilding wrecked cars. An effort is made to run through enough power plants so that the cars will be maintained to an average condition. The costs include interest at eight per cent on the investment and eight per cent depreciation, on the assumption that in 12½ years the development in motor car design will make the present cars obsolete.

Information for determining the cost of operation is procured largely from reports submitted by each operator to division headquarters where a general report is compiled and forwarded to the general office. At the general office we have found it an advantage to keep a card index of each car on which we enter the performance reported for that car each month. Naturally, these reports are more or less inaccurate, especially as to the number of miles operated. However, in the course of a year the result is a fairly good average.

As a means of justifying these costs I wish to refer to a test made a few years ago under which the operation of 40 motor cars and 40 hand cars in section service was studied for a period of two months, in order to determine the saving that could be made with motor cars. While, of course, the mileage of cars in section service varies, the result should have been a fair average. The hand cars required an average time going to and from work of 48 min., thus resulting in a cost for the time of the foreman and seven men and the maintenance of the car of $2.27. The motor cars required 24 min., or a cost of $1.43, making a net saving per day for the motor car of

84 cents or $189 per year on a piece of equipment costing about $300. This figure is obtained after making all the allowances for operating costs previously mentioned.

The costs which have been applied to section cars are the average costs for all types of cars. A section car on our line averages about 250 miles per month, while an inspection car averages about 500.

Accidents

Another feature of motor car operation which has had considerable attention is the question of accidents. Most of the rules for the operation of cars are designed to prevent accidents. We have found that as the experience of the operator increases the number of accidents is materially decreased. Of course, this is a condition which may be reversed temporarily by some unusual accident, but it is undoubtedly true that, as the operators become more experienced, there is less fast running and greater care exercised generally.

The most common causes of motor car accidents in the order of their importance are as follows:

1. Collisions with autos at road crossings and with other motor cars.
2. Handling cars off and on track.
3. Derailments caused by striking animals or obstructions on the rails, running into open switches, etc.
4. Getting off or on cars while in motion.
5. Collisions with trains.

Some of the most important rules designed to prevent accidents are as follows:

Limit speed to 20 miles per hour.
Approach street or road crossings and interlocking plants under full control.
Do not follow a moving train closer than 1,000 ft.
Be prepared to stop within half the range of vision.
Do not operate a car at night or through a tunnel without a light on the front of the car.

In conclusion, I should say that every maintenance officer can and should take an interest in the motor cars, at least to the extent of looking them over whenever he has an opportunity. By doing this he will impress those under him with the fact that the "boss" is interested in having clean, well painted, well lubricated cars, and this carries much more weight than what the maintainer says. A good motor car, well maintained, is one of the best paying pieces of equipment a railroad owns.

Saving Time, Money and Labor in the Repainting of Bridges

ONE OF THE expensive items of maintenance work is the cleaning and repainting of steel bridges. At the present time this class of work is being performed largely by hand, a handicap which doubtlessly will be overcome in time by the use of more mechanical equipment. Along this line, the experience of a large American company which maintains a railroad in the tropics and which utilizes mechanical equipment to the utmost is of interest. Savings of from 50 to 70 per cent were made in costs, while the work was completed in from one-fourth to one-third of the time normally consumed.

The data which are given here were taken from a report to the officers of the company and cover performance and cost records on a number of bridges. During a period of 75 days, four single truss bridges with lengths of from 126 to 156 ft. were completely cleaned and repainted. These structures had not been painted since 1918 and were badly covered with surface rust but with the exception of the overhead work, they were not pitted to any extent. The equipment, which was used, consisted of a tie-tamper compressor of the four-tool size, four paint spray nozzles, one sand blast nozzle, four wire brushes and from four to six scaling hammers, the power supplied being sufficient to handle any of these units in the number given. The paint gang consisted of six men, a white foreman and five natives of the section of the country traversed by the road. The foreman was paid $175 a month, one man was paid 20 cents an hour and the other four at the rate of 17½ cents an hour. All worked nine hours a day. The native laborers had previously worked in a machine shop with air operated tools.

In actual use, the compressor was placed off the track at one end of the bridge, usually about 50 ft. from the abutment and a galvanized pipe extended to the point where the work was to be done. A short piece of pipe fitted with five ½-in valves was connected with the original line, thus permitting the use of five air hose and the individual control of the air on any one hose line without disturbance or interference with the remaining sections of hose.

At first, work was started with four men chipping and cleaning and one painting but this practice was discontinued. In the second method, all men chip and clean one section thoroughly, four men working with the tools and the fifth man doing whatever chipping was necessary on parts where it was impossible to use the machine. When one section was cleaned, the chipping tools were disconnected from the air lines and the paint sprayers substituted. The fifth man in this case kept the others supplied with paint. During the change of tools and, when necessary, the piping, the compressor was shut down each time with a resulting reduction in the amount of gasoline consumed.

A number of small corners and parts of columns were found that could not be chipped to advantage with the machine. There was also some trouble in cleaning off the tops of large rivets, caused by the inability of the men to keep the hammer working at 60 lb. pressure on the rivet head. This formed only a small portion of the work and was usually left until all other work on the section was completed. The compressor was then stopped and all men finished the work by chipping by hand. About 85 per cent of the work was accomplished without trouble by the mechanical tools.

All bridges were painted with Cunningham's mixture, which is composed of eight parts of tar, two parts of Portland cement and one part of kerosene. However, in using the paint spray, it was generally found advantageous to add a little more kerosene, making the mixture about one and one-half parts kerosene to eight parts tar. This mixture cost about 35 to 40 cents a gallon and was made up on the work as needed. The machine handled four hose without any trouble and all steel was thoroughly painted, all longitudinal sections being given two coats. No painting was done during rain and all steel was thoroughly dried before using the spray. It was felt by those in charge that while there was undoubtedly some waste in painting small steel members with

paint sprays, the quality of the work was so much better that there was no comparison between that and the hand method.

THE COST OF PAINTING AND CLEANING BRIDGES

Machine		Hand	
First Bridge			
Labor	$170.65	Labor	$584.60
Materials, Paint, etc...	51.32	Material	71.40
Supplies for compressor machine	25.63		
	$247.62		$656.00
Second Bridge			
Labor	$222.66	Labor	$625.00
Material	63.06	Material	91.60
Supplies	47.50		
	$332.22		$716.60
Third Bridge			
Labor	$238.50	Labor	$645.35
Material	65.82	Material	87.20
Supplies	32.50		
	$336.82		$732.55
Fourth Bridge			
Labor	$234.65	Labor	$721.90
Material	60.62	Material	96.40
Supplies	31.20		
	$326.47		$818.30
Total cost by machine	$1,244.13		
Total time by machine	75 days		
Saving in cost	$1,679.32	Total cost by hand	$2,923.45
Saving in time	235 days	Total time by hand	310 days

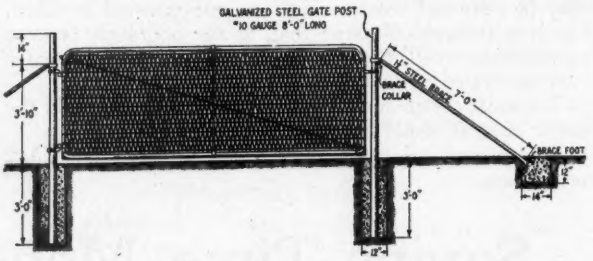
It will be noted that, although no allowance has been figured for probable increased basic labor prices, a saving of $1,679.32 was effected. Still more important is the showing in time saved. Where it formerly took 310 days to complete the work by hand, it only took 75 days with the machine method, or a saving in time of 235 days.

Two of the largest bridges on the road were painted by hand in 1919 and 1920, and in 1916 and 1917, respectively. The first structure, although not quite completed, took 13 months at a cost of $5,060.41. The work on the second (time not given), cost $6,247.50. At the time this report was made, repainting by mechanical equipment methods had been under way on the second structure for about a month. From the progress which had been made, it was estimated that the work would be completed in an elapsed time of five months at a total cost of approximately $2,000 or about $4,200 less than for the hand methods.

The total investment for the machine was $2,624.10, and for equipment $1,145.88, or a total of $3,769.98. Allowing for repairs, extra equipment and depreciation, it was felt that the installation would save more than its cost in one year.

Southern Railway Launches Extensive Fencing Program

THE Southern Railway has undertaken an extensive program of fence construction, for which purpose it has created an organization known as the fencing department. This department is under the supervision of a general foreman and includes a force of 40 men divided into 4 gangs, each consisting of a foreman, an apprentice foreman, a cook and 7 laborers. Each gang is provided with sleeping, cook, tool and material cars and is equipped with the necessary tools, a motor car and a push car. The gangs are working according to a systematic program



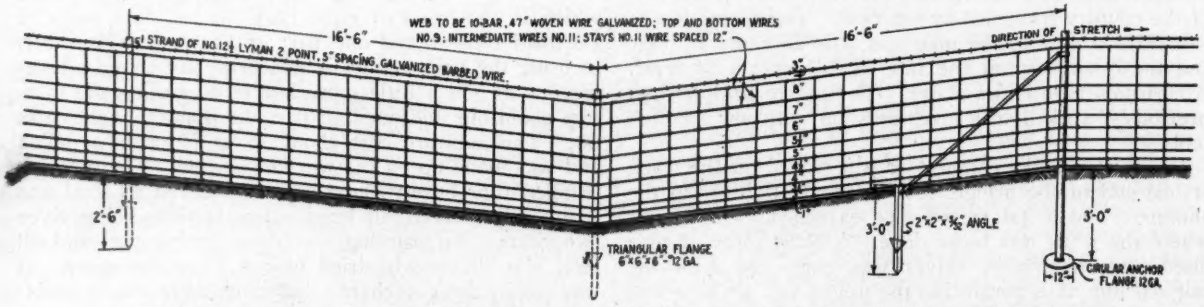
Standard 12-ft. Tubular Steel Frame Gate and Supports.

whereby they are concentrated on one division at a time, the gangs being located at intervals of about five miles.

The right-of-way is being fenced with woven wire 47 in. high with one strand of barb wire three inches above the woven wire, supported on Red Top steel studded tee posts with Dirt-Set end and corner posts. These materials are distributed along the right-of-way by the fence gangs by means of their motor car and push car, thus eliminating the use of a work train.

In setting these posts the men use a driving cap with which they are enabled to set approximately 30 posts per hour per man. When working continuously a gang builds about six miles of fence per month of 26 working days. The cost of building this fence varies according to the character of the subsoil and the amount of right-of-way that it is necessary to cut over, averaging $1.54 per rod in 1922, including labor and material as well as cattle guards, the cattle guards being of local design. Approximately 200 miles of fence was built in the first ten months of 1922 at a cost of $98,000.

The construction of this fence was followed by the immediate reduction in the number of claims paid for live stock killed on the right-of-way, these claims having been reduced $74,000 on those portions of the line which were fenced last year. The experience of this road is that it practically pays for the fencing the first year it is in service in the reduction in the amount of money paid out for claims. The fencing also prevents trespassing and adds much to the appearance of the right-of-way.



Typical Elevation of Southern Railway's Standard Woven Wire Right-of Way Fence With Posts

How Can We Develop Good Foremen?

Further Contributions to the Contest on the Selection and Training of These Important Men in Track Organization

HOW to select promising candidates and enlist their enthusiasm, how to instruct them and encourage them in the course of their efforts to acquire proficiency in track work and how to determine their ability as gang leaders are among the points discussed by contributors to the contest for the best article on the recruiting, selection and training of section foremen. In the November issue of *Railway Engineering and Maintenance*, page 432, the two prize winning and three of the other papers received in the contest were presented. Many of the other papers contain valuable suggestions relating to the solution of this problem and in order that they may receive serious consideration from our readers we present below abstracts of several additional papers received in this contest, it being necessary to condense these papers owing to the large number received.

What a Good Foreman Can Do—On the Valley Division of the Santa Fe Coast Lines in California.

He Must Know How to Handle Men

By J. D. KEILEY
Supervisor, Chesapeake & Ohio, Richmond, Va.

Indirectly, the solving of the question, "How to train section foremen," will be one of the chief elements in the solution of highly economic track maintenance. The standard of maintenance work, as well as the all important factor, cost per unit of work, is directly reflected and predicated on "How well the section foremen have been trained."

Cheap labor in the past made the study of cost production or cost per unit of work, or the proper utilization of man hours, a neglected factor. Man hours was the cheapest material. No longer is this true. Once paid for unproductive man hours have absolutely no salvage value. First of all, track foremen today should know thoroughly how to get the biggest production out of the allotted man hours.

In no other single industry or business does the so-called "human equation" play such an important part. Factory production conditions can be regulated and anticipated. Not so with track work. Nature's elements, water, wind, etc., control. With section forces employed over such wide area, the section foremen must depend in the main on their judgment and resources. Section foremen must also be resourceful in every emergency. Last, but not least, the foremen must be master craftsmen in track maintenance.

In the final analysis, the section foreman is the one who has the expenditure or disbursement of material and man hours under his direct supervision. While wasted material, in many cases, has a cash salvage value and is more or less subject to check and inspection, the improper utilization of man hours in the installation of material, when once wasted or improperly used, can never be reclaimed. Therefore, the ideal foreman is not the one who knows how to put in a crossover, tamp track and perform other maintenance routine, but the one who has in addition the ability to handle men. Concisely, the section foreman's job is twofold, to handle men and handle materials.

Prevalent is the fallacy that section labor is common labor and that section work can be done economically by transient labor. This is not true. Section labor is skilled. If anyone disputes this assertion let him take a watch and "clock" a gang containing both experienced section hands and transient laborers.

In most railroad organizations the selection of section foremen is haphazard. The foremen are drawn from the material available. In the main no effort has been made by the railroad to make the material available first class, or where the material available has been first class to train it systematically. In the past the railroads have been exceptionally fortunate in having numerous high type and capable men available for promotion to the responsibilities of section foremen. Also labor was cheap. Possibly it may not be amiss to say here that the responsibilities of section foremen are second to none.

Paramount to all other questions is, "Before you can train section foremen you must have the man material." Attracting the proper kind of men is, therefore, the first and principal question. Once you have the available material, the matter of education is more or less debatable, but can be easily and practically worked out.

Railroads have an undoubted advantage in having such a wide area in which to select men. This is practically its only advantage, if it can be called an advantage. Reasons why employment in track forces should be an advantage to the men should be pressed to the fullest extent. The proper kind of paternalism or real interest on the part of the management creates real loyalty. The interest must be real and not dished out in the form of charity.

The following are a few of the advantages existing or which can be created by the railroads to make track work attractive to the proper kind of men:

(1) Steady employment. Allowances should be so regulated and work so planned as to furnish the gang with permanent work the year round. This factor alone will attract the settled men.

(2) Outdoor work. There is always a certain type of man which is naturally attracted to outdoor work.

(3) Pass privilege. Judiciously and fairly handled, the pass privilege, especially the system annual and foreign road pass, has a great attraction.

(4) Housing. In all places where it is possible and practical, the company should furnish a foreman's house and also labor shanties. Minimum rentals, if any, should be charged. The house should be maintained at all times in good condition of repair. This applies not only to foreman and labor houses, but also to all camp cars.

(5) Commissary. The commissary should be run by the railroad and all goods retailed to the forces at cost and in any case slightly below current retail market prices. This is practical, as has been proven by at least one railroad.

(6) Farming. In many places the right-of-way is sufficient and the ground fertile enough to make the farming of small patches an attraction. This should be encouraged.

(7) Vacation. According to the length of service, vacations should be allowed with pay.

(8) Hospital, etc. Hospital and doctor service should be rendered at minimum cost and traveling nurses should visit, giving practical advice as to care of children, etc.

(9) Loyalty. This is the greatest thing in any organization and can be only created by the management through the show of real honest interest in the welfare of the men.

After obtaining the proper caliber men for promotion they should be encouraged to take correspondence school courses, even to the extent of the railroad paying the fee. Classes or other organized meetings should be arranged for a discussion of the various problems of maintenance. Discussions could well relate to such matters as the number of man hours required to install a tie or a rail, to tamp a joint, etc. The practical end should be gained by shifting the prospective foreman from one force to another. This should be done so he can see and learn the various methods of accomplishing the same result. If he works under one foreman alone, he will lack prospective and will tend to become dogmatic in his work with the idea there is only one way to do a given type of work.

Insure Permanent Employment

By G. S. Crites,
Division Engineer, Baltimore & Ohio, Baltimore, Md.

To be a successful section foreman a man should have a sound body, a reasonably quick, clear thinking mind and good morals. With these attributes and that quality of leadership, which is more inborn than acquired, any man should soon develop into a foreman, providing he can speak, read and write the English language. The trouble is to get and hold men of these qualifications in our gangs. In some parts of our country the native labor fill most of these requirements, but with our enlarged commercial activities this native labor is scarce and its fitness for foremanship is getting less.

The first requirement to attract good native labor to our ranks or to get and hold good foreign labor is an assurance of reasonably permanent work. Each gang should have an established minimum size below which it will not be cut. The gang should be large enough to allow a few of the younger men to be retained, because no matter how good a track hand a man may be, if he does not develop into a foreman in a few years, the chances are that he will never be a good one. The kind of men that will make good foremen want permanent work and their qualifications are such that they can obtain regular work with other concerns if the railroads cannot provide it. Positions of esteem attract desirable applicants. The quickest way to make a trackman's job esteemed by even the poorest labor is to make it continuous, at least as regards the section gangs.

Within the cities and towns on this division we established section gangs of 8, 10 and at one location 20 men. Each gang is given one or two assistant foremen as gang leaders at a rate of pay about $15 per month less than the foremen. These are permanent positions and when a man gets one of these he is sure of a job as long as he can do the work and sooner or later he will be foreman and, if he cares to work for it, he can become a supervisor.

It would appear to the writer that the problem of getting material for training into section foremen depends primarily on being able to promise the right man a regular job. After you get the right man it does not make much difference where or how you start him, providing you let him know by his pay check and by his promotions that he is getting along. Give a young man, with a sound body, clear mind, good morals and an ability to speak, read and write English a regular job in a gang doing important section work and if he has a reasonable inborn sense of leadership he will be able to handle one of the less complicated sections within one year.

Pick Good Men and Watch Them Closely

By A. Burgett,
Supervisor, Erie Railroad, Huntington, Ind.

The labor situation in track work has changed materially in recent years and the field for the selection of foremen has narrowed greatly. When native labor and the best of foreign immigrants were available, it was common to have several men on each section with enough experience to become foremen. As most of the native labor has drifted to the industrial centers and the desirable foreign labor has found better paying work elsewhere than on the sections, the latter have been left with men incompetent for promotion or have been filled with imported and inferior types, too unreliable for promotion to foremen. It has therefore been necessary in recent years to take special measures to obtain foremen to replace those dropping out. It is, of course, desirable to train men on the railroad which is to employ them as in no other way do foremen learn the practices, standards and methods that give individual roads their physical character.

The first and most necessary step is to insure regular employment, as in this way only can desirable candidates be obtained and retained a sufficient time to enable them to learn the practical side of the work. The men should be placed with the most competent section foremen on the division, who will teach them how to handle all kinds of track work properly and instruct them in the incidentals that pertain to it.

If these men show ability and are earnest in their endeavor to learn, they should be encouraged by being promoted to leading man or assistant foreman, which, with the increase pay, will be an added inducement for them to stick and thus be ready for any vacancy in the foremen's ranks or for the position of temporary section foremen or assistant foremen in extra gangs in the summer. Thus, they will receive excellent training in switch work, rail laying and ballasting of track in which practical knowledge can be gained in no other way, as well as an opportunity to show their ability and to get the practical experience in handling a section while the regular foreman is on extra gang work. As the leading men or assistant foremen are being taught the practical work, they should be required to study the book of rules and instructions that may be in force on the line, such as a

book of standard practices, book of standards, etc. They should, also, be well instructed and examined in the basic operating and flagging rules and methods of properly protecting their track in case of emergencies, such as derailments, wash-outs, etc., so that when they are called upon to pass an examination, they will be prepared to answer all questions properly and intelligently.

By this method intelligent young men from the country and small towns with common school education, knowing there is an opportunity for them to work at good wages and to learn a trade, may be induced to enter railroad service with the knowledge that when they make good, they will obtain promotion, which assures them good wages and steady employment near their home communities. This system should be followed up closely by track supervisors, division engineers and other supervisory officers, as it is only by personal contact and a word of encouragement to show the students that their work and efforts are appreciated, that good men may be retained in the service and material for future section foremen assured.

An Optimistic View

By James Sweeney,

Supervisor, Chicago & Eastern Illinois, Danville, Ill.

There is more to the section foreman problem than the rate of pay. Section labor is a well defined branch of common labor. It is unskilled labor which does not permit of colonization and, therefore, does not appeal to the foreigner as does the work in the steel mills and similar industries. The result is that, especially in old, established communities, the section forces consist largely of native born men who have failed to learn a trade or to get a start in business. It is not a floating class of labor, neither is it an illiterate class, thanks to our compulsory school system. It is made up largely of old men and boys. The old men die and the boys, as a rule, go into some other line of work, but once in a while when we need a foreman badly we make one out of one of the boys. If he has the right stuff in him he makes a pretty good foreman.

Along with the idea that the rate of pay is a controlling factor, we have another well established delusion that the present day foreman is not quite up to the standard of the old time foreman who built the railroad and then ran the section. My foremen rarely leave to go into other work, and just as rarely is it necessary to discharge one. Age claims them, of course, but age has also added years to the young boys who came to us and enough of them stay to fill the vacancies. I believe that the ranks of the section foremen are filled today with men better equipped than those we had some 10 or 15 years ago, when we were wondering where the section foremen of today were coming from.

We expect a good deal from our section foreman these days, more sometimes than we realize, and it is surprising how nearly he comes up to our expectation. We keep in closer touch with him since our districts are shorter and construction work is lighter. We give him more specific orders than in the past and as a part of this close supervision we require such a volume of reports that the old time foreman would have required the services of a clerk.

The engineer has been another factor in relieving the foreman. One of our pioneer foremen was famous for his ability to line a curve by sighting over the tips of his fingers with arms outstretched. The same foreman was credited with having given instructions to a party of engineers staking that same curve, "Don't drive them stakes down too solid I may have to move them."

Viewed in the light of the past the section foreman of today is more of an assistant foreman with the roadmaster on a motor car acting as a foreman. In this capacity, he meets the requirements fully and there appear to be more where he came from.

Choose Foremen From the Gangs

By D. J. O'Hern,

Roadmaster, Elgin, Joliet & Eastern, Joliet, Ill.

I feel that three years of experience is necessary to make a competent track foreman, capable of doing any kind of track work on a section. Wherever possible, I choose my foremen from men in the gangs. We offer no special inducement to men who wish to become track foremen. They go to work as laborers, but it is suggested to them that they keep their eyes and ears open and watch the foreman in all of his work so that they can fit themselves for a track foreman's position in a period of three years. I also tell the foreman to allow such men to line and surface track and give them an opportunity to do every kind of work pertaining to a section, so that they will be capable of handling a foreman's position when a vacancy occurs.

I do not approve of the apprentice system for the reason that if you pay one man more than the others working on a section, when the section forces are reduced to three or four men in winter, the men who are left become jealous of the man who is drawing more pay because they all have to do the same kind of work. This method was tried on our road and failed.

In selecting a man for foreman I choose a good clean-cut, tidy appearing man, who is honest and sober and takes an interest in the work. If a man has these qualifications, has a liking for track work, watches every part of the track to see that it is kept safe for moving trains, and takes practically as much interest as a foreman, I know that I have a good man.

I believe a foreman should have a common school education, be able to read, write and figure so that we can understand his reports. It is not important that he finish the eighth grade, as we now call it, if he has a good clear brain and uses it. You can't expect to get a college man to go to work on a section and train himself for foreman's position.

Qualifications of a Track Foreman

By Frank Donahue

Roadmaster, Chicago, Milwaukee & St. Paul, Worthington, Minn.

Before being appointed a track foreman it is necessary that a man have a year or more of practical experience as a track laborer under a competent and tried foreman, who will teach his student foreman to be loyal, energetic and ambitious for the company as well as himself. If the railroads would allow a slight increase in salary to this student foreman it would be an inducement for him to try to become a foreman and it would also show him that the railroad was taking an interest in him.

The foreman in charge of the student foreman should instruct him in most of the work performed by a foreman, for example; surfacing and lining track, repairing switches, the proper use of the track level on straight track and on curves, the use of the gage and the renewal of ties. When the student foreman is competent in these operations it is next in order to give him a thorough drilling on switches. He should be impressed with the importance of always closing switches as failure to do this results in serious accidents. He should also be placed in some large yard where he can be well drilled

in practical switch work for one year, as he will learn more in six months in a large yard than he would in a smaller yard in a much longer time. He should be taught how to put in different kinds of leads, frogs and switches. He also should be taught how to repair switches, which have been run through, either in the daytime or by night.

The second essential, which is equally as important as experience, is an eighth-grade education or its equivalent, in order that a man may become acquainted with the track work readily and also so that he can make out his reports, and his time and material books. He must have sufficient education to understand the book of rules, interpret any messages that he may receive and pass the examination given a foreman in a creditable manner. The foreman who is teaching the student should drill him on the clerical work which is demanded of a track foreman and let the student actually do the work under the foreman's supervision. The roadmaster or supervisor should take a personal interest in the student foreman and encourage him in his efforts to become a foreman.

Two student foremen should be drilled each year on a division and when they are competent they will be ready to fill the vacancies which are bound to come by foremen being retired, leaving the service or for other reasons. The sooner the railroads start this training system the better, as it will give them foremen who are equal to the position and thus the standard of track work will be upheld.

Try Them Out as Relief Foremen

By W. A. McCULLOUGH

General Roadmaster, Atlantic Coast Line, Waycross, Ga.

The candidate for section foreman should be selected from among the white laborers working on the track. His age should be between 21 and 30 years. References should show that he is sober and honest and he should be able to pass a physical examination, including an examination on colors. He should have at least 12 months' experience under a competent foreman before being promoted to a place as foreman. This experience should be divided between the main line and yards. After he has had sufficient experience the foreman under whom he is working should allow him to handle the work and men under his supervision. After he has had sufficient experience, say for six months, he should be used as a relief foreman.

Before sending him out as a relief foreman he should be familiar with the rules that apply in any way to the safe handling and protection of his work. He should have at least a common school education.

The common practice of developing an apprentice foreman is to allow him to work under some foreman and after a sufficient length of time to try him out on relief work and then if his services are satisfactory to promote him to a place as foreman as soon as a vacancy occurs. I believe the best method to train apprentice foremen is to select one section on each roadmaster's district that is part yard and part main line and use it as a training section, allowing the senior man in this gang to handle the work under the supervision of a competent foremen is to select one section on each roadmaster's man this senior man should be sent out and the next senior man should take his place as leader of the training gang.

It has been my experience that foremen who have been trained on the road for which they are working are much more satisfactory than foremen hired from other roads, as they are accustomed to the climate and general conditions in every way. The wages paid to induce men to enter this class of service depend altogether on circumstances, including the location of the road and wages paid outside labor.

Apprentices cannot always be promoted according to seniority as some men will apply themselves better and learn more in six months than some others can learn in two years. At the same time you will find in a great many cases that the man who is not so apt at learning the work will make the best foreman in the long run, if the foreman in charge will take the time and patience to teach him. The roadmaster and general roadmaster should be just as careful in selecting a foreman to instruct the apprentice as they are in picking the men they expect to train as foremen.

Decisions of the Labor Board

THE FOLLOWING are abstracts of a number of decisions of the United States Railroad Labor Board, which have definite application to maintenance of way labor:

Western Maryland's Contract Violates Transportation Act

In a case involving the contracting of track, bridge and building maintenance, the operation of drawbridges, pumping stations, etc., and emergency construction work to the Dixon Construction and Repair Company, by the Western Maryland, the Labor Board decided that the contract entered into by the railroad and the repair company is in violation of the Transportation Act insofar as it purports to remove the employees from the application of the Act and that the employees of the contractors engaged in maintenance of way work are under the jurisdiction of the Labor Board and are subject to the application of the Act and decisions of the Board. Decision No. 1889.

Separate Organization for Maintenance of Way Foremen Approved

A case was brought before the Labor Board by the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers with respect to the proposed organization of a separate association of maintenance of way foremen on the Kansas City Southern. The evidence shows that on April 28, 1923, the general manager of the Kansas City Southern and affiliated lines notified the general chairman of the maintenance of way brotherhood that it was the intention of the carrier to cancel the agreement that had been negotiated with the committee representing the foremen, and to circulate a ballot among the foremen and assistant foremen independently of the other classes of employees for the purpose of determining whether they wished to be represented by a separate organization. Upon the refusal of the brotherhood to participate in such an election, the election was held without their cooperation, with the result that 173 foremen indicated their desire to be represented by a supervisor's association of maintenance of way foremen, while 20 indicated their preference to be represented by the brotherhood.

The decision of the Labor Board is that the carrier has complied with the provision of decision 1644 as well as the provisions of the Transportation Act in the conduct of this election and approves the organization of the separate association of foremen.

A dissenting opinion was filed by A. O. Wharton and E. F. Grable, denouncing the decision of the majority as being contrary to the labor provisions of the Transportation Act, contending that this provides for a self-governing group of employees who shall be entirely free

from coercive influence of the employer and that this condition cannot be fulfilled under the arrangements provided for in this case.

In a supporting opinion Chairman Ben W. Hooper stated that the Labor Board had long held that maintenance of way foremen were entitled to maintain an organization separate from the employees they supervise if they so desire, and that in both the shopcrafts and clerical organizations this principle has been continually recognized by the board.—Decision No. 1979.

Road Ordered to Distinguish Between Carpenters and Carpenter Helpers in Bridge and Building Gangs

The United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers entered a complaint before the United States Railroad Labor Board against the Kansas City Southern with respect to the rating of a considerable portion of the bridge and building employees as helpers instead of carpenters. The evidence shows that whereas formerly all the men in the gang were rated as carpenters, during 1921 and 1922, a considerable portion of these gangs were rated as helpers, the carrier taking the position that the fluctuation in the ratio is evidence of the requirements and character of the service to be performed. The brotherhood, however, compained that the railroads arbitrarily abolished some of the positions as carpenters from time to time and reemployed the men so rated as helpers at a lower rate of pay although they continued to do the same work.

In the opinion rendered by the Labor Board, attention was called to the fact that no decision has ever been given with respect to the classification of carpenter's work in bridge and building gangs and ordered the railroad to hold conferences with its employees for the purpose of establishing the difference between the work of a carpenter and the work of a carpenter helper, with the provision that in case of failure to arrive at any agreement, the matter should be re-submitted to the board for decision.—Decision No. 1978.

Time and One-Half Starts at End of Tenth Continuous Hour

A case was brought before the Labor Board by the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers with respect to the interpretation of the overtime rule as applied on the Norfolk & Western. On April 2, 1923, a section gang reported for work at 7 a. m., and was relieved at 11 p. m., having worked through the meal period. Each of the employees involved was allowed one eight-hour day, two hours overtime at the pro rata rate, five hours at the rate of time and one-half and an additional one hour for the meal period at pro rata rate. The brotherhood claimed that these employees should have been paid 10 hours at the pro rata rate and the remaining six hours at the rate of time and one-half, contending that the punitive rate should commence at the end of the first consecutive 10 hours. The decision of the board is that time and one-half time starts at the expiration of the tenth continuous hour on duty computed from the employee's regular starting time where this continuous service includes the meal period. No deduction should be made therefor and the employee will, at the first opportunity, be allowed 20 min. in which to eat.—Decision No. 2015.

When Not to Use Treated Timber*

BY C. M. TAYLOR

Superintendent Treating Plant, Philadelphia & Reading, and Central Railroad of New Jersey, Port Reading, N. J.

THE ECONOMIES resulting from the treatment of cross ties are so well founded that it is rare today to find a railroad in the country that is not treating a majority of its ties. There is one policy, however, that needs to be investigated—which is to the effect that a railroad usually starts out to treat ties for the high-speed main tracks first and then gradually broadens its policy to include branch lines and sidings. Oftentimes the branch lines are poor paying properties and will not stand for the extra financial burden thrust on them for the first 10 years, whereas the main lines, which are the paying ones from the traffic standpoint, will carry the extra burden without undue strain. Yet from the eventual savings involved, considering the property as a whole, there is much more economy involved if the side-track and branch-line ties are treated first.

The problem of timber preservation, so far as cross ties are concerned, is nothing more than a determination of what preservative and the quantity thereof will keep the ties from decay until the ties are rendered unfit for service by mechanical destruction. The most economical program to be obtained is one under which a tie will just begin to decay when the tie is unfit to carry the load either through being cut by the rail or from being spike-killed, or from any of the other mechanical diseases of ties.

It is obvious that, to arrive at any theoretical solution of this problem, it is better to over-do the treatment rather than skimp it. Furthermore, there is a general tendency to improve the mechanical conditions of the track and it would be short-sighted to figure too closely on preservation treatment. Thus, it is clear that as we leave the main line tracks, traffic becomes less and less destructive of rail and ties, so that we gradually reach territories on all of our properties where ties, if properly treated, can reasonably be expected to last 50 years—because it is just a matter of having preservative enough in the tie to keep it from decaying. Mechanically, there is no probem.

What of the Culls?

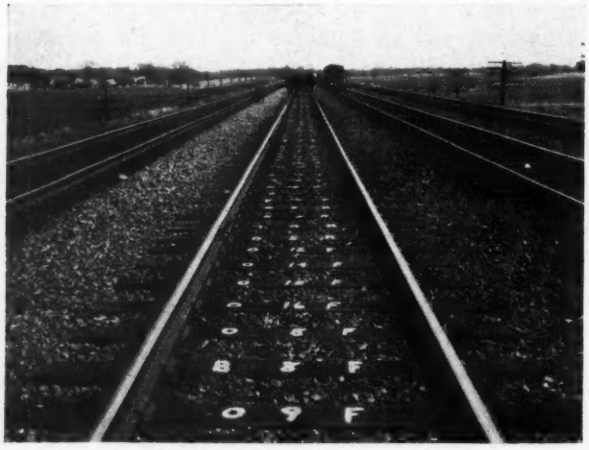
Another problem ahead of chemical timber preservation arises from the character of ties usually put into branch lines and sidings. For years and years it has been a practice on all roads to put the inferior ties, the culls, on the sidings where they will "last a few years anyhow." Like the poor, they are always with us and we have to take care of them. Into the yard and sidings they go and in a few years, out they come. It does not cost as much to put a tie in and out of such tracks, but the expense is great nevertheless and if a good treated tie could have been used, the renewal thereof could be left for the next generation.

There has been a very marked tendency on the part of some railroads to avoid the use of treated switch ties, The only reason I can give for this practice is that on the lines east of Omaha, for instance, the majority of switch ties are white oak, presumably because the ancient

*Abstracted from a paper presented before the Maintenance of Way Club of Chicago, at Chicago, on September 17, 1923.

halo that surrounded the name "white oak" continues to shine in the minds of some of our operating officers. The quality of white oak going into switch ties is very little, if any, better than that going into cross ties, and any engineer who has really investigated the life of untreated white oak cross ties we get today, knows that they do not last more than 7 years on an average. If there is anything that has depreciated in value in recent years it is certainly the quality of the timber that goes under the name of white oak, and not to treat it is to increase our maintenance costs. If you really believe in timber conservation, use treated red oak or gum, or beech or maple switch ties.

Switch ties should be delivered in proper lengths, treated, so that they will not have to be sawed to suit the situation, except in a very few instances. The time to size the timber is before treatment, not after; and



A Test Section on the Philadelphia & Reading

furthermore, the policy is more economical. Get the habit of ordering and getting timber cut to the right length before treatment and save money and time on the job. Your men will work better, your job will look better and the timber will last much longer.

Increase the Life of Bumping Posts

Another item of wood-preservation is the treatment of any type of wooden bumping post. A check of the situation shows that 90 per cent of the renewals are due to decay. The others are due to over-lazy train crews not riding their cars. The use of treated wood in these bumpers would add greatly to their life.

It is almost impossible to get railway officers to believe that any crossing planks rot out. A crossing is a crossing, regardless, and they all seem to think that they are worn out mechanically. All that is necessary to disprove this impression is to put creosoted oak plank on one half of the crossing and untreated oak on the other half. Be sure that the nailing strips under the creosoted half are also treated; because I find that many of our crossings deteriorate from poor foundations.

In the case of poles, there is keen rivalry between the western cedar pole, butt-treated and the full creosoted southern pine poles. The former has as its chief advantage the fact that it can be painted any color desired, but beyond that point, so far as strength throughout the life of respective poles are concerned, the creosoted pole has the advantage. Its strength continues the same and where color has no bearing its use is recommended.

Some people think that it is not necessary to treat tie plugs. To my judgment it is folly to use untreated tie-plugs in treated ties. The cost of treatment is small and the benefit derived is great. Treated tie plugs act just like a medicated gauze in a wound, stopping the spread of decay, as well as functioning as a plug.

No Added Fire Hazard

It can be said that railway officers as a class think that the creosoting of wood adds an extra fire hazard to all timber construction. Recently an officer on one of our railroads, after getting a report of a fire on a creosoted bridge, said, "It looks to me as if, instead of preserving the wood by creosoting, we are just adding an extra hazard to timber bridges by making them easier to burn." However, his engineers proved to him that not only were creosoted bridges less of a fire risk than untreated bridges, but that in nearly 80 per cent of all his bridges, the fires had occurred on the untreated bridges. Also that on one division the use of creosoted timber had reduced bridge gang expense many-fold.

Timber, treated, is, and always will be, the cheapest permanent construction and to eliminate it from consideration is to add unnecessary expense to our properties. The problem of getting maintenance officers to think in terms of treated wood is largely a matter of education. At first it is a question of what items on the bill of material to treat and the usual answer is to treat the sills, caps and stringers and use untreated posts. To follow such a program is to forget the labor cost of renewals and to lose sight of the fact that the treated caps and sills will outlast two or three untreated posts.

In conclusion, my answer to the question "When not to use treated timber" is that the only time you should use untreated timber is when you know positively that it is a temporary structure or you know the timber must be painted some other color than black. Beyond these two, there is not a place in the maintenance of our railroads today where some kind of wood treatment should not be used. This includes sills of buildings and all timbers that are anywhere near the ground line of buildings. Therefore I say "stop, look and listen" before you use any more untreated ties or timbers of any description.

Stop means—is timber the right material to use on this work? Would concrete or steel serve better? If so, use them but be sure of your ground.

Look means—that if you have some doubt, try to find out what some other railroad in your territory is doing on similar work. Pick out a progressive property.

Listen means—that you should learn as much as you can from engineering societies and associations about timber problems and the proper utilization thereof. Don't be afraid to listen and learn.

Curvature Imposes an Increased Burden on the Ties

Tool Equipment for Bridge, Building and Water Service*

Comprehensive Lists of Devices and Appliances Used by Railroad Maintenance Forces

REGARDLESS of the character of the men no gang can produce good results if it is not supplied with the proper number of tools of a good quality. The equipment to be furnished is largely the outgrowth of experience. Practices vary in different localities and the varied conditions, so it is inadvisable to recommend one standard set of tools to be used on all railroads. Rather it has been considered desirable to compile a list of the tools furnished and used by most railroads, the number in each item being an average for the roads represented. With this information, a bridge, building or water service gang may be completely equipped by omitting the tools not required in a particular locality.

LIST OF EQUIPMENT FOR A BRIDGE AND BUILDING GANG OF ABOUT 10 MEN

1—Motor car capable of carrying 10 men and to be designed not to run faster than 15 miles per hour.
1—Push car having a capacity of 4,000 lb.
2—25-ton ball bearing jacks with jack levers.
4—15-ton ball bearing jacks with jack levers.
2—24-in. screw jacks.
2—16-in. screw jacks.
4—12-in. screw jacks.
4—8-in. screw jacks.
2—Pulling jacks.
4—Track jacks.
1—Hand pulling device or a winch.
4—5 ft. cross-cut saws.
1—6-ft. cross-cut saws.
8—Saw handles.
1—3-in. ship auger.
1—1½-in. ship auger.
1—1¼-in. ship auger.
1—1⅛-in. ship auger.
1—1-in. ship auger.
4—15-16-in. ship auger.
3—⅞-in. ship auger.
5—13-16-in. ship auger.
4—¾-in. ship auger.
2—⅝-in. ship auger.
2—9-16-in. ship auger.
500—Ft. ¾-in. manila rope.
400—Ft. 1-in. manila rope.
120—Ft. 1¼-in. manila rope for snub line.
100—Ft. 1½-in. manila rope for snub line.
2—8-in. metal snatch blocks.
2—Sets ¾-in. double blocks.
2—Sets 1-in. double blocks.
1—Set 1-in. triple blocks.
1—3-ton chain hoist.
1—Gasoline trench pump with hose.
4—Chopping axes.
6—Axe handles.
4—¾-in. chains 6 ft. long with hook and ring.
4—⅝-in. sling chains with round and grab hook.
1—Way car chain.
2—Timber dollies.
2—Pad locks.
1—10 ft. straight edge.
1—16-ft. straight edge.
1—Anvil, 75 lb.
1—Bench vise.
1—Portable forge.
1—Hardie.
2—Pair tongs.
2—Pair pick-up tongs.
1—Pein hammer.
1—Set of bolt dies, ½-in. to 1¼-in.
1—Flattener.
1—Rounder.
1—Tool grinder.
1—Grindstone.
2—S wrenches, ¾-in. by ⅝-in.
2—S wrenches, ⅞-in. by ¾-in.
1—S wrench, 1-in. by ⅞-in.
2—8-in. Monkey wrenches.
2—12-in. Monkey wrenches
2—16-in. Monkey wrenches.
1—Key wrench.
1—¾-in. ratchet wrench.
1—12-in. Pipe wrench.
1—18-in. Pipe wrench.
1—24-in. Pipe wrench
4—Track wrenches.
1—Chain wrench.
1—16-lb. maul.
2—12-lb. mauls.
4—8-lb. mauls.
4—6-lb. mauls
6—Spike mauls.
1—Dozen maul handles.
2—Hack saw frames, adjustable from 12 in. to 16 in.
1—Dozen hack saw blades, 16-in.
1—Dozen hack saw blades, 12-in.
1—Saw set.
1—Saw clamp.
1—Dozen 8-in. mill files.
2—16-in. files.
1—Wood rasp, 16-in.
4—Red flags.
4—Green flags.
4—Yellow flags.
4—White lanterns (tubular).
4—Red lanterns.
2—Green lanterns.
2—Yellow lanterns.
5—Adzes with extra handles.
2—Track gages.
3—Claw bars for track spikes.
2—Shackle bars for ¾-in. bolts.
1—Light portable stiff legged derrick for mounting on push car.
6—Pinch bars.
4—Lining bars.
2—Chisel bars, 1¾-in. octagonal 3 ft. long.
2—Wrecking bars.
4—Track chisels.
4—Cold chisels, ⅞-in. by 8-in.
2—Grub hoes.
6—Dirt picks with four extra handles.
6—No. 2, Track shovels.
6—Long handled round pointed shovels.
4—Short handled round pointed shovels.
1—Set scaffold plank.
1—Post auger.
6—Wheel barrows with steel trays.
1—Post hole digger.
1—10-in. wire pliers.
1—Sand screen.
1—Large tool box.
1—Gross torpedoes.
12—Fusees.
1—Complete set of slow order boards.
1—Water pail.
1—Set of hand derails with necessary lights to protect boarding cars against careless switching.
3—Snow shovels.
2—Scoop shovels.
1—Tile spade.
6—Cant hooks (with 6 extra hickory handles).
4—Peavies (with 4 extra hickory handles).
6—Lug hooks.
2—Pair timber tongs.
1—Set scaffold hooks.
1—Steel drum with 50 gal. gasoline.
2—Carbide lights.
1—Squirt oiler.
1—1-gal. Oil can.
2—2-gal. Oil cans.
1—5-gal Oil can.
1—10-gal Oil can.
1—Tarpaulin, 25 ft. by 50 ft.
1—Tarpaulin, 10 ft. by 20 ft.

TOOL EQUIPMENT FOR A WATER SERVICE GANG OF ABOUT SIX MEN

1—No. 25 adjuster, stock.
1—No. 10 adjuster, stock.
1—Set of stock and dies, ⅛ in. to 1 in.
1—Set of stock and dies, 1 in. to 2 in.
1—Set of ratchet pipe dies, ¼ in. to 1½ in.
1—Ratchet brace with bits.
1—No. 1 pipe tapping machine.
2—Sets of pipe taps, ¼ in. to 2½ in.
6—Pipe cutters, No. 1 to No. 6.
1—Chain pipe vise.
1—No. 2 pipe vise.
1—No. 89½ combination pipe vise.
1—No. 1 upright drill.
1—Set of drill bits, ⅛ in. to 1 in.
1—Set of pipe reamers, ¼ in. to 2½ in.
1—Set of No. 115 screw plates for bolts, ¼ to 1¼.
2—Chain tongs, No. 13.
2—Chain tongs, No. 14.
2—Pipe wrenches, 6 in.
2—Pipe wrenches, 8 in.
2—Pipe wrenches, 10 in.
2—Pipe wrenches, 14 in.
2—Pipe wrenches, 18 in.
2—Pipe wrenches, 24 in.
2—8-in. monkey wrenches.
2—10-in. monkey wrenches.
2—12-in. monkey wrenches.
2—18-in. monkey wrenches.
6—S wrenches.
1—Pipe holder.
2—Ball pein hammers, 1-lb.
2—Ball pein hammers, 4-lb.
2—Calking hammers.
3—Claw hammers.
1—12-lb. maul.
2—Pouring ladles.
1—Trench pump with hose.
1—Chain hoist.
1—Light collapsible tripod for lifting stand pipes.
2—Sets of tackle blocks and line.
6—8-in. cold chisels.
4—Diamond point chisels.
4—One-half point chisels.
4—Cape chisels.
2—Cold cutters.
12—Calking and yarning chisels.
6—Track shovels.
6—Long-handled, round-pointed shovels.
6—Tile spades.
6—Clay picks.
2—Steel punches.
1—Claw bar.
1—Gooseneck wrecking bar.
2—Ship augers, 13-16-in.
1—5-ft. cross-cut saw.
1—Hand saw.
1—Chopping axe.
1—Hand axe.
1—Steel square.
1—Gasoline blow torch.
2—Soldering coppers.
2—Screw drivers.
2—Plumbers' friend.
4—Buggy bars.
2—Spud bars.
2—Chisel bars.
1—Track chisel.
1—Hot cutter chisel.
1—Anvil, 75-lb.
1—Portable forge (with hammers and tongs).
2—Scoop shovels.
2—8-in. screw jacks.
1—Pair of ice tongs.

*Abstract of a committee report presented at the convention of American Railway Bridge and Building Association at Seattle, October 16-18, 1923.

1— 8-lb. maul.
1— 4-lb. maul.
4—Joint runners, No. 1.
4—Joint runners, No. 2.
4—Joint runners, No. 3.
1—Lead melting furnace on wheels.
1—Pouring pot with hook.
3—Sets ¾-in. to 1½-in. single blocks.
2—Sets 1-in. to 2-in. double blocks.
1—Set 1-in. triple block.
2—12-ft. ladders.
1—Punch.
1—16-ft. ladder.

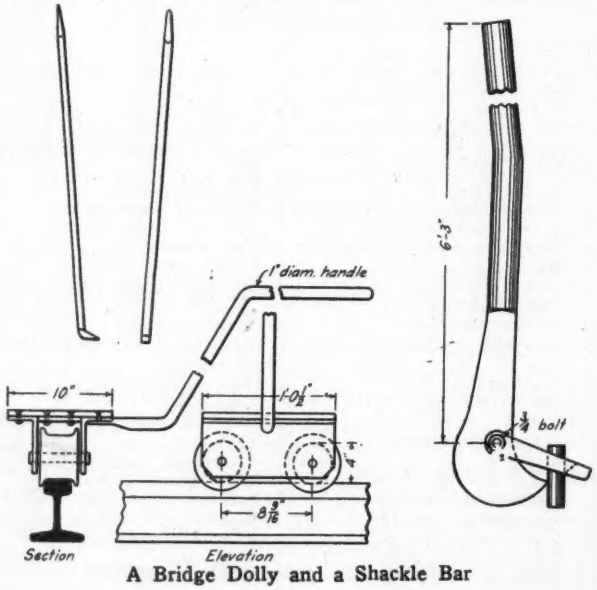
Tools Must Be Handled Carefully

Employees should be cautioned not to abuse tools. Motor cars, hand cars and push cars are frequently loaded beyond their capacity, thus bending the axles and causing needless energy to propel this equipment and expensive delays. Chains, jacks, rope, chain hoists, stone hooks, timber hooks, and wire rope, must not be strained beyond the safe load, as this practice is not only unsafe, but destroys property and decreases the efficiency by not having tools in proper condition for future or emergency work.

When gangs are moving from one job to a succeeding location the time can be used profitably in repairing and making various kinds of equipment. Carry hook handles and cant hook handles can be made from a good quality of timber pile heads (preferably hickory), which will give far better service than the turned handles furnished by the store department.

Probably no individual tool is used more by timber gangs than pinch bars. A considerable number of coil car springs are continually being scrapped. This class of material makes exceedingly good pinch bars and they are easily made in portable forges carried by most bridge and building gangs.

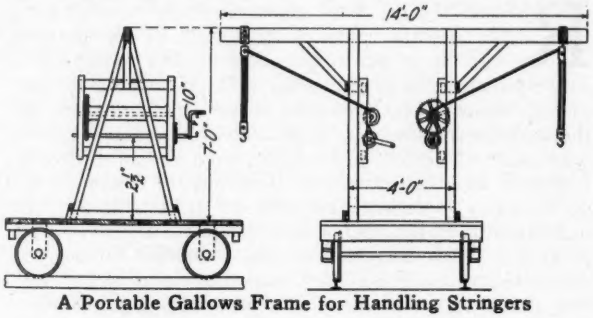
The bridge dolly illustrated is used by the Southern Pacific. The frame is made of structural steel shapes riveted together. This tool will last longer and handle heavier loads than the ordinary dolly with a wood frame. It



A Bridge Dolly and a Shackle Bar

can be constructed by any structural steel gang at a nominal expense. The Duluth, Missabe & Northern has found that the use of an air rivet hammer to settle the track spikes and line spikes hastens the completion of the decking of timber bridges, especially in preparing the track ahead of a pile driver on a 10-deg. curve. It was also used to drive drift bolts. As the pile driver had its own air brake equipment it was an easy matter to furnish enough air for the hammer.

Various devices have been used to remove drifts, such as shackle bars, reconstructed track jacks, and claw bars. The shackle bar shown has proved exceedingly useful and saves considerable time and expense. The shackle bar consists of a modified form of a claw bar with a cutting edge and a clevis, also with a cutting edge which grips the drift on the opposite side of the bar. The clevis is pin-connected to the shackle bar and made of such length that the two cutting edges are a small distance apart vertically when holding the drift. The greater the force exerted on the end of the bar the tighter the grip on the



A Portable Gallows Frame for Handling Stringers

drift, which forces the bolt to be lifted out of the timber a small amount and the bolt is quickly removed by successive lifts. Before using the shackle bar it is necessary to cut a notch about ¾ in. deep in the old timber so that the cutting edge can grip the head of the drift.

Special Equipment

The acetylene cutting and welding outfit has probably saved more money in comparison with its initial expense than any other item of bridge equipment. One man with an acetylene torch will cut off more rivet heads than two squads can bust off by hand work. It is especially useful in cutting off girders, angles, I-beams and plates where a close fit is not required. Castings on pile drivers and pumps can often be welded in place and returned to service, thus avoiding loss of time. The renewal of caps on trestles where traffic is frequent allows but a limited time for bridgemen to do their work. The time required to change trestle caps depends on the removal of the drifts, which can easily be accomplished by jacking up the caps about two inches and burning them off close to the pile. The use of the acetylene torch for burning drifts may easily save 25 per cent of a gang's daily payroll on large jobs.

Pneumatic motors will greatly expedite the work of boring holes incident to the construction of docks, draw bridge protection piers, cribs and the complete renewal of long trestles. The boring of 3,600 holes by compressed air on a reconstructed crib saved, by actual test, an equivalent of one man working 192 days. The holes varied from 24 in. to 34 in. in depth. One man operating a pneumatic auger will bore holes through the guard timber and ties on trestles fast enough to keep a small gang busy placing the bolts and drifts. A large number of roads have pneumatic tie tamping machines, which provide portable air compressors for pneumatic boring. The compressors are easily removed from the track and can run a limited distance on the track under their own power.

When a large number of bridge ties are to be renewed a tie dapper equipped wih a circular saw will save considerable expense in labor. An actual test showed that three men dapped from 85 to 90 ties per day, which was about 50 per cent more than could have been cut out by hand labor. It is questionable whether the dapper is economical on small jobs, as the initial time consumed in setting up the machine will offset its saving. Where a considerable width of the ties is to be dapped it would

probably be cheaper to have the material planed to a uniform depth on one face. Some bridge supervisors object to planing ties, as it removes the dapped shoulder and permits the track to get out of line more easily.

The ordinary winch supplied to most bridge gangs is a useful part of their equipment. There are also several hand-power pulling devices on the market which are lighter and can be installed more readily in places inaccessible to the winch. The hand power puller is easily transported by two men. It is operated by one man and can pull about 48 tons when 100 lb. is applied at the lever handle. This device can be used for removing large stumps, trees and rocks, wrecking buildings, moving houses, loading and unloading heavy material, raising bents, pulling bridges in place, dismantling bridges, demolishing piers, pulling pile clusters together, removing boilers from buildings, moving heavy machinery and cars, and pulling pipe together, and can be applied to various other uses in bridge and building work. This machine will save the services of at least two men as compared with a winch.

A portable forge and necessary blacksmith tools are almost indispensable with each gang. They will save time in getting tools repaired and returned to service. Various repairs can be made, such as the sharpening of picks, track chisels, pinch bars, claw bars and shovels, and the welding of chains, bolts and other tools.

The chain hoist should be given more consideration. It can be used for about the same work as the two-sheave block and tackle. In general, one man operating a chain hoist will accomplish the same results as one or two men operating tackle blocks. Another advantage of the chain hoist is that it will hold a load at a certain height, while a load suspended by tackle blocks lowers due to the stretching of the rope.

Equipment that is used infrequently and is expensive, such as high duty jacks of over 25 tons capacity, tie dappers, portable pneumatic compressors, air motors, small concrete mixers, acetylene burners and the larger types of steam and centrifugal pumps, should be stored at division headquarters and be shipped as required for special work.

There are still some hand operations that should be done by power. Some form of a light pneumatic hammer for driving small sheet piling, operated by air furnished from a tie tamper compressor, would be of considerable assistance to a small gang. The steam hammer is very useful for this work, although most maintenance jobs are too small to warrant the expense of setting up a steam plant. In changing or repairing old masonry, it is desirable to drill holes for iron pins in the old masonry so that the work can be bonded together. The drilling is usually done by hand, requiring the services of two men in each squad. If some form of light pneumatic drill could be built and operated by one man, considerable time and expense would be saved on such jobs.

Particular care should be exercised to obtain tools of good quality. Poor tool equipment is expensive, as the time required to make repairs and the inconvenience due to breakage will more than offset any saving in first cost. Inferior grades of chopping axes, adzes, rope, shovels, jacks, etc., will not only retard the output, but discourage the better class of employees that usually take pride in their work.

The cement gun should be given consideration by bridge and building men for the purpose of coating masonry structures with cement mortar. This equipment is particularly useful for repairing the concrete on the underside of overhead bridges and in the tops of tunnels where the blast from locomotives has cut out portions of the masonry, leaving the reinforcing exposed. It is necessary to cover steel work with mesh and preferably to sand blast all surfaces before applying the cement coating. Where the amount of concrete is small the cement gun will produce more satisfactory results than the pouring of cement in forms, as gunite is forced in place by air pressure, thus producing concrete with a greater density.

Special Tool Equipment for Water Supply Gangs

The wireless pipe locator has proved useful in locating water pipes, valves, meters, etc. However, the magnetic dipping needle is another simple instrument that can be used more particularly to locate uncharted valves and service boxes. It is convenient for locating such facilities under depot platforms and pavements, and will work accurately even when the valve is covered with ice, snow or even 12 in. of concrete.

The electric leak locator is valuable in locating leaks, particularly under pavements, concrete and platforms, where the water will follow the soft fill of the trench before finding an outlet.

A rather unique and efficient outfit is now obtainable for thawing frozen water pipes, which consists of a small generator coupled directly to a gasoline engine mounted on a truck. The entire equipment is operated as a unit, and will prove very serviceable, particularly in districts remote from electric service. In electric thawing as in all electrical work, the prime factor is to make the proper contacts with the pipe.

Where the larger sizes of water pipes are to be laid a long distance and require exceptionally good backfilling, the pneumatic tamper with a portable air compressor is a great labor saver and will produce better results than hand tapping. Two pneumatic calking hammers on 12-in. mains and larger will do the work of six to eight men more satisfactorily.

The report was signed by J. S. Huntoon (M. C.), chairman; D. T. Rintoul (S. P.), vice-chairman; E. K. Barrett (F. E. C), F. N. Graham (D. M. & N.), E. P. Hawkins (M. P.), and J. J. Taylor (K. C. S.).

Minority Report

Motor cars for bridge and building gangs should have a free running engine and be designed to run in low gear on grades. The writer is of the opinion that 15 miles per hour is too slow and that 25 miles per hour should be the maximum speed. The push car should have a capacity of 5,500 to 6,000 lb. and be equipped with roller bearings. The 12-in. screw jacks are convenient, but the general use of screw jacks should be discouraged, as ratchet jacks are preferable. D. T. RINTOUL, Vice-Chairman.

Discussion

The suggestion of the committee that the motor car be used more generally as a power unit for a wide variety of bridge and building operations brought out active discussion. T. D. Kemp (Southern) described the practice of a bridge and building supervisor on that railway of operating a saw table with his motor car, by which arrangement he cuts many thousand feet of lumber economically. J. S. Robinson (C. & N. W.) referred to a roadmaster on that road who bores ties, sharpens tools and performs other operations by means of attachments for his motor car, with a resultant saving in time and money. A. B. Scowden (B. & O.) referred to a signal supervisor on his road who has equipped his motor car with a Delco generator and motor for such work. C. A. Lichty (C. & N. W.) opposed the use of small portable saw rigs in the field, advocating instead the establishment of mills at central points.

Tests Show Actual Loads Carried by a Track Jack

TESTS were recently completed by the Underwriters' Laboratories, Chicago, at the instance of Templeton-Kenly & Co., Ltd., Chicago, for the purpose of determining exactly what loads a track jack is required to carry in raising track. In view of the fact that no previous data have been available, the information derived from these tests may prove of value not only to the manufacturer for whom they were made but also to the users of jacks as throwing some light on the type, capacity and characteristics of track jacks most suitable for use in regular service.

The plan followed was to use a standard track jack as a portable testing machine by replacing the ordinary lever or lining bar normally used to operate the jack with the equivalent of a scale beam on which the load lifted by the jack could be noted. The jack used in these tests was a No. 217 Simplex track jack, while the weighing apparatus or scale beam consisted of a hexagonal bar of

The Jack With the Weigh Beam in Position in the Lever Socket. Note Rule Clamped to the Top of the Rail

1 7/8 in. diameter, and about eight feet long, over which was fitted a 350-lb. weight, arranged to slide back and forth along the length of the bar to serve as the poise or runner on the beam. This weight was moved back and forth by means of a continuous screw set alongside the beam and operated by a small hand wheel placed at the inner end. A steel tape was used to note the position of the weight on the beam, while a quadrant marked off in degrees was provided to note the vertical angle of the beam. The end of the beam was designed to fit into the lever socket so that the jack could be raised by operating the scale beam exactly the same as the ordinary lever.

Before attempting the use of the apparatus on the track it was carefully calibrated in the laboratory. This was done by setting the jack in a testing machine and applying a known load to the foot of the jack while the position of the weight on the beam and the angle of the beam at the instant that the beam exactly balanced the load was noted. This procedure was repeated for a full range of loads within the capacity of the jack and for all possible positions of the beam from the top to the bottom of the stroke and the data obtained from all of these tests were plotted on a chart showing the weight carried by the jack corresponding to all possible positions of the weight on the beam and all angles of the beam.

The apparatus was then taken out on the track for the actual test. After the jack was firmly set in the ballast between the ties, the weigh beam with the weight in the lowest position was inserted in the lever socket and worked up and down just like the ordinary lever for the purpose of jacking up the track. The amount of the lift was noted with the aid of a transit, sighting on a rule clamped to the top of the rail near the jack. After the track had been jacked up a fixed amount, say one-half inch, the hand wheel on the weight beam was turned for the purpose of sliding the weight out on the beam while careful observations were taken to note the angle of the beam and the position of the weight on the beam at the instant that the beam started to drop, in other words, the exact position of the weight and the angle of the beam when the beam exactly balanced the load on the jack. The track was then jacked up some more and the operation repeated until readings had been obtained for a series of lifts of the track.

The character of track construction on which these tests were conducted is given in the following table:

Test		Rail	Joints	Ties	Ballast
No. 1	Main Line Track C. & N. W.	100-lb.	4-hole angle bars	6″x8″	Crushed Stone
No. 2	Under Frog of Switch Lead C. & N. W.	80-lb.	4-hole angle bars	6″x8″	Cinders
No. 3	Crossings of A. T. & S. F. and B. & O. T. C.	90-lb.	4 and 6-hole angle bars	8″x10″	Crushed Stone

With the data obtained in these tests and the help of the control diagram, the following table of results was developed:

Actual Load Lifted by Jack lb.	Distance Raised in.	Force Required on 66-in. Lining Bar at Beginning of Stroke	Remarks
TEST NO. 1—MAIN LINE TRACK, C. & N. W.			
5,600	1-1/4	102 lb.	Jack was five ties from joint.
5,800	1-5/16	104 lb.	
6,500	2	118 lb.	
TEST NO. 2—UNDER FROG OF SWITCH LEAD, C. & N. W.			
7,400	5/16	140 lb.	
8,200	11/32	157 lb.	Frog for another turnout in other rail almost opposite the frog lifted.
9,480	7/16	183 lb.	
11,250	15/32	220 lb.	
12,250	9/16	242 lb.	
12,050	5/8	237 lb.	
13,000	21/32	255 lb.	
14,250	31/32	280 lb.	
TEST NO. 3—CROSSING, A. T. & S. F. AND B. & O. C. T.			
12,350	1	243 lb.	Loads given are those on one of two jacks used to raise the crossing.
13,450	1-1/4	265 lb.	
15,200	1-9/16	298 lb.	
17,300	2	340 lb.	
15,800	1-1/4	310 lb.	
18,900	1-7/8	372 lb.	
20,200*	1	392 lb.	

*This test was made under another crossing in the same location.

The first column shows the weights carried by the jack for the lift of the track recorded in the second column. The third column shows the equivalent load which would have had to be applied to the end of a jack lever 66 in. long at the top of the stroke, these figures being calculated from the recorded positions of the weight and the angle of the beam.

WHAT'S THE ANSWER?

This department is an open forum for the discussion of practical problems of engineering and maintenance of way. Readers are invited to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. *Railway Engineering and Maintenance* also invites the co-operation of its readers in answering any of the questions listed below.

Questions to Be Answered in the February Issue:

(1) What are the objections to taper rails in place of compromise angle bars for connecting heavy rail with light rail in (1) main lines and (2) side tracks?

(2) How should an old hard finished wall be prepared for tinting?

(3) To what extent is it practicable to use steam for melting snow at yard switches?

(4) What is the minimum depth of earth, gravel or sand overlying rock in which it is safe to drive piles for a trestle?

(5) What is a practical way of cleaning rock ballast at railway crossings subject to heavy traffic?

(6) When building plank crossings or platforms is it advisable to leave an air space below the plank?

(7) What considerations determine the angle for a wing wall for a culvert placed squarely with the track?

(8) How often should the interior of steel water tanks be painted and what is the most suitable paint for the purpose?

Distributing Ties in Winter

To what extent are section forces warranted in distributing throughout the winter the ties for the next year's renewals by means of motor cars?

There is no apparent economy in distributing ties for the next year's renewals during the winter by motor cars. Cross ties should be furnished during the fall and winter months to each section in sufficient quantities to take care of their next season's renewals. These cross ties should be unloaded on the station grounds or at some point on the section where the car in which they are received can be set out and unloaded without work train service and where the ties can again be loaded on flat cars or push cars for distribution over the section.

Ties received direct from the mills or from the woods where they are hewn or from treating plants should be piled up and permitted to stand a sufficient length of time before they are installed so that they will be well seasoned and free from sap and excess preservatives. They should not be scattered out or distributed over the section any faster than the section gang requires them for installation.

Ordinarily, the best time for tie inspection is early in the spring. Ties that are to be renewed during that season can be marked and new ties unloaded directly at the point where they are to be used. They can either be loaded from the station grounds or side tracks on flat cars, taken out by local freight trains and unloaded, or they can be taken out by section crews with motor cars as required.

This course insures their distribution at the points where they are most urgently required and also permits of their being distributed on other sections on the division which may require them more than the one on which they were unloaded. The greatest elasticity for the distribution of the new ties is secured in this way and the ties can usually be handled for less money. There is no work train service involved. The ties are unloaded promptly and cars in which the ties were received are released, also the ties can be re-inspected to better advantage. Furthermore, if mixed lots of ties are received in the same car, they can be sorted and separated and the soft and hard wood ties stocked in different piles, likewise the larger and smaller ties.

W. H. PENFIELD,
Engineer Maintenance of Way, Chicago, Milwaukee & St. Paul, Chicago.

A Double Purpose Pipe Line for Water Tanks

What is the objection to the use of the same pipe line for the inlet and outlet of (1) tanks serving water columns, and (2) general service tanks?

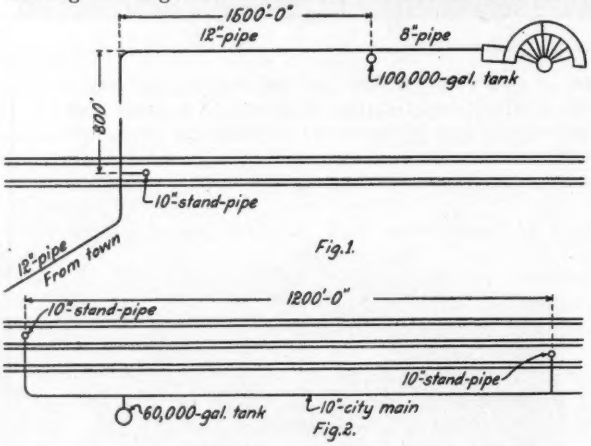
First Answer

It is decidedly objectionable to connect the pump discharge into the line serving a water column on account of the possibility of water hammer or the quick closing of the water column valve breaking the pump casting or otherwise injuring the pumping machinery. In the case

of general service tanks, the same pipe line is frequently used for both inlet and outlet, unless there are large valves on the line subject to rapid closing which will create water hammer. As an example of the latter case, it is frequently the practice to tap the pump discharge line with one inch to two inch connections for supplying water to stock pens or for station use, which practice has not proved objectionable. R. C. BARDWELL,
Superintendent of Water Supply, Chesapeake & Ohio, Huntington, W. Va.

Second Answer

I have found no real cause for objecting to the use of the same pipe line for the inlet and outlet service in tanks serving water columns where the proper type of standpipe has been used. A properly designed standpipe should be equipped with an automatic device for controlling the length of time taken to close the main valve.



Typical Layout of Standpipe Service Being Provided on Canadian National

If the governing part of the device and the relief valve are properly adjusted to suit each local condition the standpipe may be installed at any part of the system without fear of danger.

At the present time we are connecting several standpipes in this manner since the pipe sizes are suitable and we know from past experience that it may be done safely. Furthermore, it can be done at considerably less cost than would be the case where a separate line is laid from the tank to the standpipe; also there is less pipe to maintain. A glance at the sketches inclosed will suggest the economy of the one-pipe system. We have standpipes in use which are supplied by an independent pipe from the tank, but in each case this was done because the main supply pipe was too small and the standpipe was located only a short distance from the tank.

Since the same pipe line may safely be used in conjunction with a tank and standpipe, there is no good reason, in my opinion, why it cannot be used with the tank alone. H. P. BLAKE,
Engineer Water Supply and Heating, Canadian National, Winnipeg, Man.

Third Answer

Any discussion of the suitability of the same pipe line for water tank inlet and outlet use is incomplete without considering certain special conditions likely to be present. One of these conditions is found in the case of a tank located a considerable distance from the source of supply where it becomes advisable to drain the line following each pumping during the cold season to avoid a freezeup. In such cases it is usually advisable to extend the discharge line to a point above the surface of the water in the tank and to supply the standpipes or distribution system from a pipe terminating only a short distance above the tank bottom.

More frequently, with the adoption of water treatment by railroads, the condition exists where the tank is used for the dual purpose of a storage tank and settling basin, or where after-precipitation occurs after the treated water reaches the storage tank. In such cases it is usually advisable to use two pipe lines, so that by means of a floating intake, the treated water may always be taken from the top, thus avoiding any accumulation of precipitates in the lower region of the tank.

Piles in Filled Ground

Where foundation piles must be driven through filled ground is it objectionable to cut off the piling above the original ground surface and need creosoted timber necessarily be used under such conditions?

It is generally conceded that untreated wood may be used safely for piles where the amount of moisture in the soil is sufficient to insure that the pile is kept moist throughout its entire length. Under normal conditions capillary attraction can be relied upon to keep the upper portion of the pile, which is buried in the dried material, in an adequate state of saturation to insure its preservation. In other words, it is considered good practice to use untreated piles in almost any ordinary foundations when the pile is completely buried in earth which can reasonably be expected to remain moist within a few feet of the surface.

In the case of filled ground, the answer would seem to hinge entirely on the character and depth of the filling and the shape or contour of the fill, and calls for the exercise of judgment. For example, a relatively flat fill of moderate depth, covering a considerable area, could be treated exactly the same as natural ground. On the other hand, the question frequently arises as to the piles to be used under a pocket abutement in a high railway embankment and the prevailing conclusion is that the drainage conditions are so nearly ideal that little moisture would be retained normally. In such cases, commonly accepted practice calls for creosoted piles.

The Pitch of Shingle Roofs

What is the minimum practical pitch for shingle roofs?

First Answer

For ordinary cedar shingles, it is our experience that a one-third pitch is the flattest pitch practicable in ordinary middle west territory, but in some of our mountain districts, subject to extremely heavy snows, a much sharper pitch is required, ordinarily around a one-half pitch.

R. B. ROBINSON,
Engineer Maintenance of Way, Union Pacific, Omaha, Neb.

Second Answer

There is a considerable variation in the pitch of shingle roofs on railway buildings, depending upon the size of the building, its location and its use. Some building roofs are made very flat, particularly where the question of head room or ventilation inside is not a controlling factor. In other cases roofs are made very steep, as where heavy wet snows would otherwise stick to them and add to the weight or where an ornamental type of roof is built.

It may be said, however, that a shingle roof should not have less than a one-fourth pitch, which is a slope

of six inches in twelve inches. While a roof flatter than this is ordinarily safe from injury by wind, there is not enough protection against the tendency of the wind to drive rain underneath the shingles and cause leaking.

The best pitch for most shingle roofs is eight inches in twelve inches or a one-third pitch. This roof, when shingles are applied properly, is secure against leakage and is preferred even where heavy snow is encountered. The advantages claimed for a steeper roof in shedding snow is usually overbalanced by the danger to life where snow and ice fall to the ground swiftly and in large masses.

It often happens, of course, that a flatter roof must be built than one having a one-fourth pitch, as where a lean-to is built which must conform to the height of doors and windows in the main building, etc. Where this is done, however, the exposed surface of the shingle should be made less than the usual 4½ in., but in no case should the exposed surface be made less than 3 in. or the pitch reduced below one-sixth, which is a slope of 4 in. in 12 in.

Shimming Track to Offset Heaving

What precautions should be taken when shimming track to overcome the effect of heaving?

First Answer

It is the practice when using shims more than one inch thick to install a sufficient number of braces on the ties to prevent the rail from spreading and in addition to apply anti-spread rods, commonly called spread rods. The anti-spread rods should be applied immediately after pulling the spikes.

The most effective way to prevent the heaving of track, however, is the use of drain tile or the digging out underneath the ties to whatever distance frost has penetrated and replacing the material removed with stone, gravel or cinders. When shimming is undertaken the close observance of flagging rules is of utmost importance unless the precaution is followed of not undertaking too large a job for the size of the force available. J. J. HESS,

General Roadmaster, Great Northern, Seattle, Wash.

Second Answer

In all cases of shimming to relieve heaved track, it is important to prepare a good surface for the shims and while adzing this surface to make sure that it will support the rail in a perpendicular position. A level board should be employed to detect any irregularities in the level of the track, as the maintenance of level track and perpendicular rail is a great factor in strengthening the shimming.

Special shim spikes should be used to correspond with the various heights of shims used. Even though the shimming is very slight the rail should be well braced with wooden braces about 1½ in. or 1¾ in. thick and 11 in. long, placed on every fourth tie for shimming up to and including one inch, and on every third tie for shimming over one inch in height. If the height of the shim exceeds 1½ in. the wooden braces should be long enough to engage the under side of the rail head and should extend to within about five inches of the end of the tie where they should be secured by dapping the tie an inch or so in addition to spiking to provide proper resistance.

In cases where the shimming necessary is in the neighborhood of four inches, the best practice is to use hard wood spreader ties which should be inserted at intervals, as an additional means of holding the gage, and to build up with planks spiked at intervals to the top of the cross ties. Spread rods for securing shimmed track are not usually recommended owing to the danger of their catching dragging equipment. A great deal of shimming may be eliminated by making easy runoffs to and from the section of heaved track. J. B. KELLY,

Assistant General Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Minneapolis, Minn.

Third Answer

In northern climates where severe frosts and protracted cold weather are encountered, the shimming of track is the only feasible method of overcoming the effects of heaving, which is caused by the freezing and consequent expansion of the moisture in the earth and ballast. In the re-arrangement of track surfaces so affected, shims are placed under the rails to raise the low spots to a proper surface, thus insuring smooth and safe riding track. It is imperative that the maximum amount of care should be exercised when shimming so that the disturbed rails should be secured as firmly as they were in their original position.

When shimming, if the top surface of the tie is found to be uneven it should be adzed level. This is necessary to give a solid foundation and to prevent the shims from breaking. Another important precaution to be observed when shimming is that the surfaces of the ties, shims, tie-plates, and rail base should be free from snow and ice, as the track is liable to spread if there is ice between the bearing surfaces. The shims should never be placed lengthwise under the rail because in that position they increase the height of the rail without widening the base and in addition are liable to slip out of place and by so doing weaken the support and become the cause of a broken rail.

It is sometimes assumed that compensation for the heaving can be made by adzing the ties at the high points. Practices such as this, if employed, should be discouraged, as they result in the weakening and rapid destruction of the ties. The shimming should be carried out far enough on each side of the heaved spot, which in many cases affects one side of the track more than the other, so that easy grades, proper surface, line, gage and strength may be insured. On the other hand, there are many instances where the heaving increases gradually, necessitating the shimming of the spot three or four times during the winter. When the track heaves so as to necessitate shimming under both rails, it is possible to crown up the rail a little higher than the high spots in anticipation of further heaving without affecting the riding condition of the track, thus saving at least one re-shimming. This is not feasible where the heaving affects only one side of the track.

At points where shimming has been resorted to, the track should be braced on at least every fourth tie on tangents and on curves up to one degree, and on at least every other tie on curves above one degree of curvature, for the depth of the spike in the tie diminishes as the thickness of the shim increases, thus reducing the holding power of the spike and affording greater opportunity for their bending due to the side thrust of trains, resulting in the spreading or widening of the gage which may eventually result in a derailment. When using shims of one inch or over, spikes of increased length, known as shimming spikes, should be used.

As the thickness of the shim increases so should its length increase. Thus, where thicknesses of ¼ in. to 1¼ in. are used, the shim should be approximately 7 in. wide and 12 in. long. For thicknesses of 1½ in. to 2½ in., inclusive, the length of the shims should be doubled and extra holes should be bored for spiking the shim to the tie. Three-inch shims should have a length of at least seven feet.

All shimmed locations should be inspected daily for broken rails often occur at points subjected to excessive heaving. Upon the approach of spring the shims should be removed in successive stages, replacing the heavier ones by those of a lighter size so that the track may be kept in fair surface and be gradually restored to its normal position. Throughout all shimming operations the tie plug plays an important part in the refilling of the holes where spikes are withdrawn. Through its use the holding power of the re-driven spike is increased and the life of the ties prolonged. F. LISTON,
Canadian Pacific, Vandreuil Station, Que.

Minimum Head in Pump Design

Is the minimum head against which a pump is to work a factor to be considered in designing electric drive centrifugal installations?

First Answer

The minimum head against which a pump is to work is a decided factor in the design of electrically driven centrifugal pumping installations. In the large majority of cases a reduction in head will greatly increase the yield of the pump with a consequent increase in the power required to elevate the water. With an electrically driven installation this will result in overloading the motor, with consequent danger of burning it out and seriously injuring the plant. R. C. BARDWELL,
Superintendent of Water Supply, Chesapeake & Ohio, Huntington, W. Va.

Second Answer

The minimum head against which a centrifugal pump operates may be a very important factor in the selection of the driving motor. The unit should be selected so that maximum economy is secured under average conditions, combined with the ability to meet maximum and minimum conditions. It is essential that the motor shall not overload at reduced head when the quantity increases. It is usually possible to secure centrifugal pumps having relatively high shut-off heads and drooping characteristic curves, and most pumps will meet this condition. In addition, the motor should be able to start under the required load and should be provided with no-voltage release and overload relays. W. B. MCCALEB,
Engineer Water Service, Pennsylvania, Philadelphia, Pa.

Winter Painting

What kinds of painting can be done to advantage during the winter?

There are a number of kinds of painting work which can be done to advantage in the winter (at least on the larger railroad systems), such as cleaning, painting, calcimining or redecorating the interior of the station buildings, thereby leaving the summer period free for outside work. For similar reasons work in office buildings, such as redecorating ceilings and walls, can and should be done during the winter months for generally the clerical forces occupying the offices in such buildings can be disturbed easier in the winter months and the work done to better advantage than in the summer time.

The interior of storehouses and shops, wherever painting is done, can also be gone over to good advantage during the winter months, provided the storehouses are not located too close to roundhouses where escaping steam and moisture will prevent the proper adhesion of paint.

Since good paint is not injured by severe cold, even steel work on bridges over waterways, such as pedestals and the under sides of the structures, can be handled to greater advantage during the winter when the water is frozen solid, permitting the use of ladders on the ice, thus doing away with the use of unhandy rigging and staging which would have to be used in summer. It must be understood, of course, that the air must be clear and free from moisture.

The adoption of such a program will save considerable money in the long run and give more steady employment to painters so that men will be available when the outside painting season opens. CHARLES ETTINGER,
Supervisor Bridges and Buildings, Illinois Central, Chicago.

[For further information on this subject, the reader is referred to pages 449, 450 and 451 of *Railway Engineering and Maintenance* for November, where there was published an abstract of a report of a committee of the American Railway Bridge and Building Association on the practicability of a uniform painting program for railroads, also a paper on the subject by T. R. Wyles, vice-president of the Detroit Graphite Company. The question of what painting can be done during the winter is considered at length in these two papers, the report of the committee coinciding in general with the view of Mr. Ettinger as to the feasibility of conducting interior painting work during the winter months, but drawing contrary conclusions relative to the painting of bridges during cold weather. The proper time for painting steel bridges and other steel structures, such as turntables and signal bridges, according to the report, is for the most part limited to the months of June to September, inclusive, except in the southern states. The report contains a statement by George A. Mitchell, superintendent of bridges and buildings on the Grand Trunk, to the effect that this company maintains a regular force of painters during the entire year, this force painting steel bridges exclusively during June, July, August and September, and doing other exterior painting in November and early December, while from December to April the painters are employed in interior work.—EDITOR.]

Stopping Leaks in Concrete Walls

What practical means may be adopted to overcome the seepage of water through foundation or retaining walls where the removal of the backfill is out of the question?

It is assumed from the nature of the question that in addition to the impracticability of disturbing the backfill, nothing may be done to protect the backfill from the entry of the water complained of, the inquiry rather being directed to ascertaining what may best be done to the accessible part of the wall. This will depend somewhat upon the conditions present—the prevalence and extent of the water in the backfill, the effect of drainage, whether the immediate cause of the seepage is porous concrete or open cracks, whether the objective in undertaking the work is one of avoiding unsightliness and a nuisance of seepage water or one of avoiding injury to the concrete, etc.

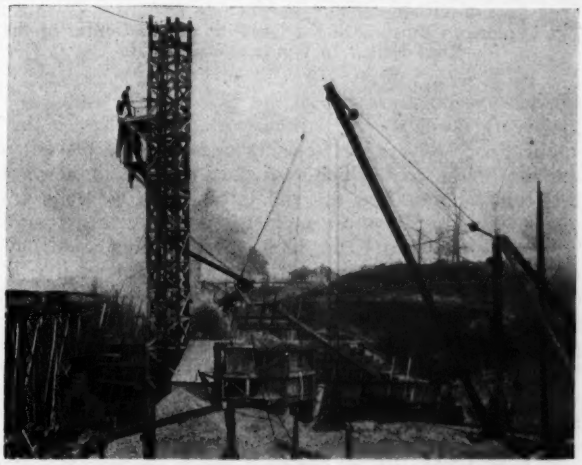
The usual form in which this problem occurs is the case of a retaining wall, say in grade separation work. In this case, the water encountered is usually that which has soaked into the fill after a rainstorm. Where the seepage trouble arises from porous areas in the concrete as air pockets, it may be sufficient to install a series of weep-holes in the wall, using two-inch pipe. This has the effect of relieving the pressure of water in the fill and not only is desirable from a standpoint of preventing the passage of water through the concrete with its resultant disintegrating effect upon the concrete and the nuisance created in the vicinity of the wall, but affords a means of draining the backfill, which is very much to be desired where the fill carries railroad tracks. If the

concrete in such areas is too porous to resist the passage of water even in the presence of holes, or if the fault present is a crack in the wall, the cure is patching.

When patching is done, it must be carried out with care in order to be effective. There are two things to consider in patching, (1) the preparation of the old concrete and (2) the proper handling of the patching material. The first step to take in preparing for the patching is to widen the cracks sufficiently to make plenty of room for the new concrete, taking care to provide vertical edges, as a feather-edged patch will soon chip out, regardless of its composition. All loose material should be chiseled out and the old concrete left clean and rough. Washing the edges with a dilute solution of muriatic acid is recommended where the crack is an old one, although the precaution should be taken to wash the surface thoroughly after the application. If it becomes necessary to open the crack to two inches or more to remove the poor concrete, it would be well to insert a few lengths of reinforcing material at intervals across the gap, making sure to fix the ends of the wire securely in the old concrete.

Before placing the new concrete it may be found advisable to install one or more weep holes in the crack through which to vent any flowing water, thus protecting the new mortar from washing until it becomes set. If there is any considerable portion of water, moreover, it is advisable to provide a permanent vent hole, preferably near the lower end of the crack or at the base of the wall, to afford the desired drainage to the backfill. Prior to placing the new mortar the old concrete should also be thoroughly wet and the bonding surface painted with a neat cement grout, the new material then being added without delay.

The new material should preferably be of the same material as the old concrete, although if the crack or patch is small, only mortar can be used. This mortar should be as lean as compatible with workability and density and should be mixed only to the consistency of damp molding sand, after which it should be calked and rammed into place. If of the proper consistency this tamping and pounding should result in the moisture just showing on the surface. It is assumed that the portion of the wall undergoing repair is wet by reason of the drainage from the backfill. However, care should be exercised to keep the patching material wet until it has set, owing to the detrimental effect of the hot sun and the absorptive power of the adjacent concrete. A patch formed in this manner is probably the best way known to cure leaking through concrete walls.



Tower and Spouting on a Large Concrete Job

Interstate Commerce Commission Reports on Two Derailments

THE Interstate Commerce Commission has issued reports on two recent derailments, which were due to conditions within the control of the maintenance of way department. The following are abstracts of these reports:

Open Switch Causes Derailment

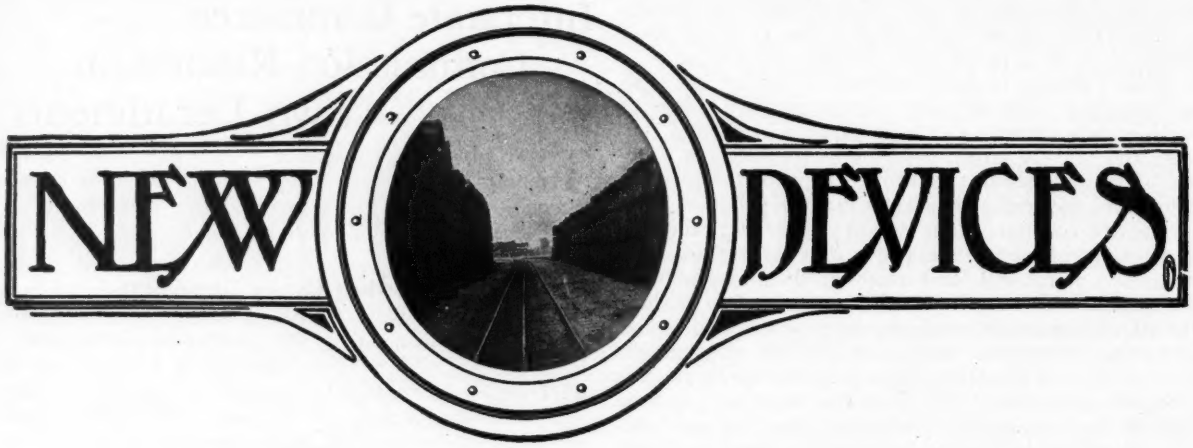
On September 10, a Norfolk & Western freight train hauled by two locomotives was derailed at a switch near Roanoke, Va., shortly after the section foreman and a track walker had changed a king pin on the switch. The first locomotive passed over the switch, was derailed and turned over on its side, while the second locomotive entered the turnout. Examination of the switch after the accident showed that the points were properly lined up for the main track, but a thorough study of all evidence by investigators for the Bureau of Safety of the Interstate Commerce Commission pointed definitely to the conclusion that the switch was not properly closed and locked when the train approached it and that the section foreman was responsible for the accident. It was shown also that the manner in which the equipment came to rest with the car trucks entirely clear of the switch points made it possible to operate the switch without difficulty, the inference being that the foreman or track walker closed the switch after the accident in an effort to conceal his guilt.

Short Crossover Causes Accident on New York, New Haven & Hartford

According to a report on an accident on the New York, New Haven & Hartford at Readville, Mass., on September 11, submitted by W. P. Borland, director of the Bureau of Safety, of the Interstate Commerce Commission, short crossovers in high speed tracks constitute a serious hazard in any case where trains are not brought to a stop before lining up the crossover to transfer the trains from one track to another.

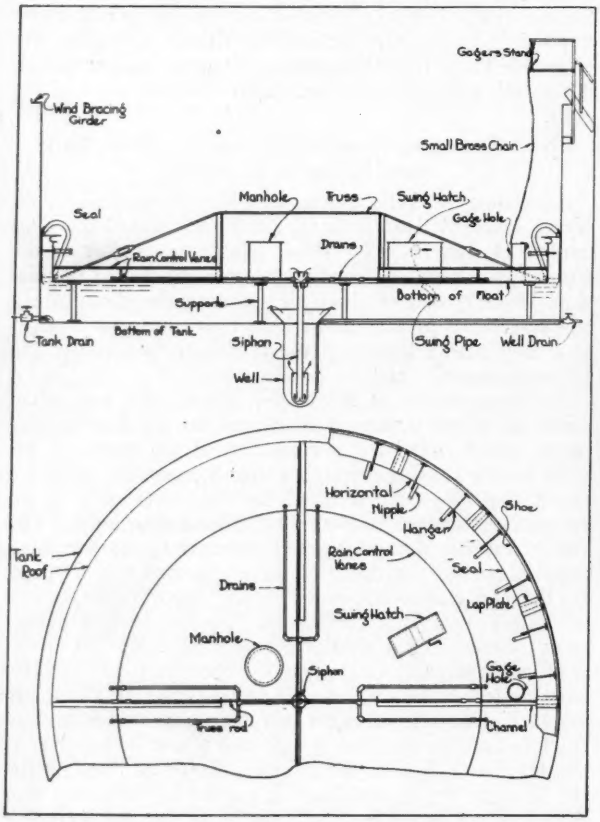
In the accident at Readville, Mass., the engineman failed to observe signals displayed at the interlocking plant, which called for a reduction of the speed of his train before passing through a No. 8 crossover, with the result that the train entered the crossover at a speed variously estimated at from 30 to 50 miles an hour. The result was the derailment and overturning of the locomotive, causing the death of the engineman and fireman. In the conclusions appended to the report, the Bureau of Safety reiterates conclusions reached in a previous report concerning a similar accident at a No. 10 crossover at Westport, Conn., on October 3, 1912, namely, that longer crossovers should be installed at all points where high-speed passenger trains are diverted from one track to another and that in any case where a crossover is shorter than a No. 20, the switches should be lined up for the straight route, stop signals should be displayed and the crossover switches should not be set for the diverging movement until after the train which is to make the movement has come to a stop.

Freight Claims Less.—A new low record in payments for claims for damage to freight was established during the first quarter of 1923, when the total declined to $10,945,127. This compares with $15,852,133 during 1922 and $29,264,164 during the same period of 1921. The claims paid during the first quarter of 1923 amounted to one per cent of the freight revenue.



Floating Oil Tank Roof Qualifies in Fire Tests

THE Chicago Bridge & Iron Works, Chicago, recently conducted a series of tests at its plant on a floating roof for oil tanks to determine its ability to eliminate evaporation losses and fire hazard. This roof is a patented



A Sketch Showing the General Plan of the Floating Roof

device known as the Wiggins Floating Roof which is designed for installation in vertical steel oil tanks where it takes the place of the ordinary fixed roof. The device consists of a steel pan one foot less in diameter than the tank, which is formed by welding together 3/16-in. plates and providing a rim 17 in. high with sufficient trussing to maintain the cross section of the roof in a substantially level line. This pan or float is flexibly connected to a series of steel sections which constitute the shoes by means of which a sliding contact and a seal is maintained between the floating roof and the shell of the tank.

This seal is made in sections flexibly connected to each other as well as to the top of the rim of the roof. A horizontal plate wide enough to cover the gap between the floating roof and the tank is welded to each shoe and the whole supported by hangers so arranged as to keep the shoes against the tank. If a shoe should come closer to the roof than its normal distance, it engages a spring-press plunger which forces it back against the shell of the tank. The flexible material between the steel and the rim of the float is built up of two layers of wire inserted in asbestos cloth and welded together, and two layers of

The Prolonged Burning of the Gasoline on the Center of the Roof Failed to Ignite the Contents

canvas, one on each side of the asbestos, the canvas on the weather side being treated with hot asphalt before application. Several self-closing openings are placed in the rim of the roof which vent the small gas-tight space between the shoe and the rim. Rainfall conditions are met by dividing the upper surface of the roof into a number of pockets 8 to 10 in. high and providing manifolds either to drain to a point outside of the tank or into it, depending on the kind of tank. The floating roof carries a manhole to afford entry and a swing-hatch for refilling purposes. The theory underlying the construction of the tank is thus one of preventing access of air to the oil surface and of keeping the open space above the oil as small as possible.

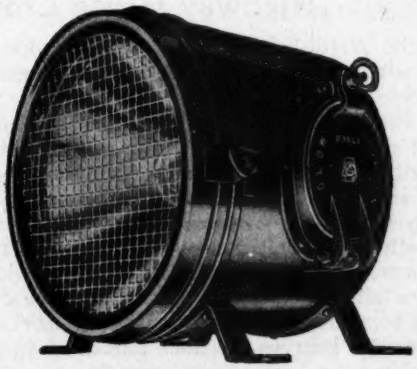
The fire tests were conducted on a tank 30 ft. in dia. and 6 ft. high with six vertical seams in the shell for the seal to span. The tank was 2 in. out of level with

a 3 in. variation in diameter. The gas space vents were left open to increase the severity of the fire tests. The tank contained about 3 ft. of water with about 2¼ in. of gasoline below the bottom of the float and 6¾ in. of gasoline around the rim.

The first test, which consisted of concentrating the flame of a blow torch against the shell of the tank above the shoe, failed to start a fire. The flame was then held at the mouth of one of the vents. This resulted in the instant ignition but short lived burning of the oil in the space. Other tests consisted of thrusting a burning piece of gasoline-soaked waste into one of the vents, burning a bucketful of gasoline poured on the center of the roof and ignited, and igniting gasoline poured completely around the edge of the roof, all of which failed to produce a fire. Although the fire in the center of the tank was prolonged for five minutes, the tests were completely successful and demonstrated to the satisfaction of the manufacturer that it would require a very unusual and severe exposure to fire to cause a fire in a tank equipped with such a roof.

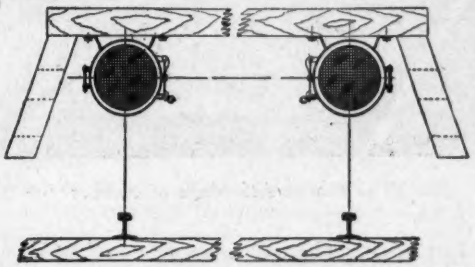
A Headlight for Track Inspection

IN order to facilitate the inspection of track at night, an interesting form of inspector's headlight has been developed by the Electric Service Supplies Company, Philadelphia, Pa., in which is utilized the patented Golden



(Fig. 1) The Headlight Ready to be Attached

Glow Reflector. These headlights are fitted with an extra front door ring having a heavy wire screen to protect the front glass and the reflector from breakage. This outer screen can be opened independently of the inner door to permit cleaning the front glass. The headlights are de-



(Fig. 2) Diagram Showing Manner of Installation

signed for use in pairs, each unit being suspended from the platform of the inspection or business car over the center of each rail. By training the beam over each rail, complete illumination of the roadbed is secured with the added advantage that the eyes of the observer do not have to penetrate the rays of light to such an extent as when headlights are installed on the railing or roof.

A New Type of Ballast Car

AS A RESULT of many years' experience with the use of its ballast cars on a large mileage of American railroads, the Rodger Ballast Car Company, Chicago, has developed a new design of car known as the Hart Selective car, which is designed to give unusual flexibility of operation. It is distinguished from the Hart Convertible car in that it has no convertible parts, the term selective having been adopted to characterize the facility with which the contents of the car may be dumped at will between the rails, outside the rails, on one or both sides or at the three points simultaneously in whatever quantity is required for the work to be done on the track with the contents of the car.

As in the case of the Convertible car the new equipment may be used either as a ballast car or as a coal car without requiring any changes in the floor or dumping features

The "Atlantic" Type Car

when transferring the car from one service to the other. For this reason the car is especially adapted to use where coal is hauled in one direction and ballast in the opposite direction. It will also be found convenient for building coal piles for winter storage.

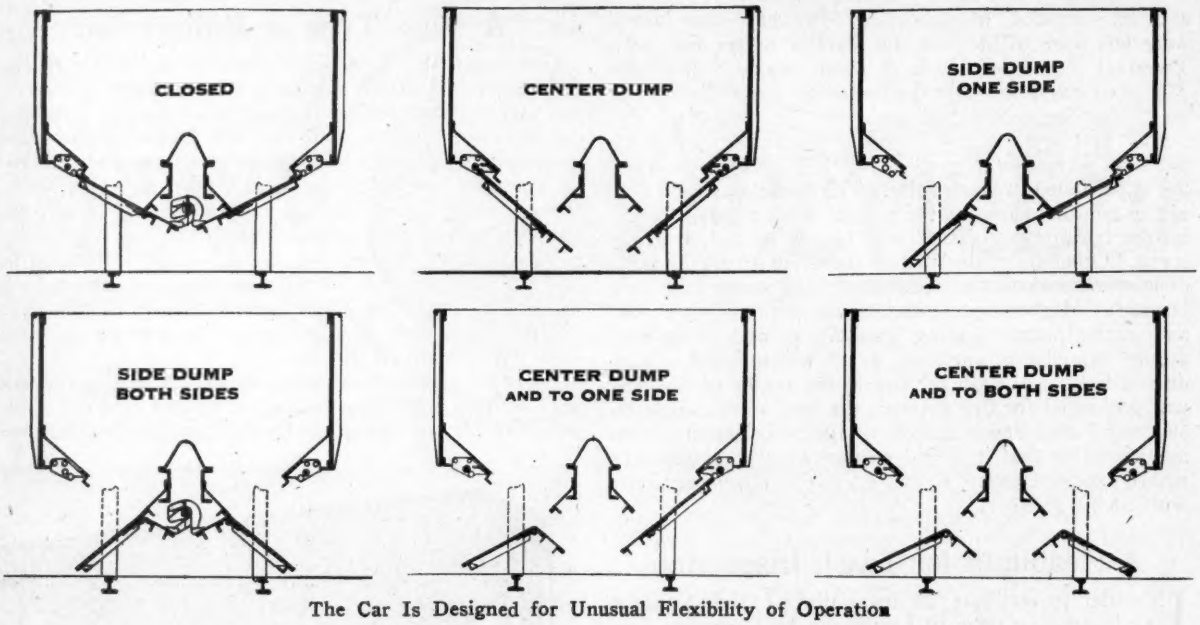
The Selective cars are of steel or composite construction and are built in two distinctive types, the "Atlantic" type, which is a high side hopper car, and the "Pacific" type, which is a gondola car. The dumping arrangement for ballast occupies the space between the trucks, but for coal service the car dumps outside the rails for the full length of the car.

As seen in the cross-section of the car, the bottom throughout the length of the ballast dumping portion is arranged in the form of twin longitudinal hoppers on either side of the center sill, which are designed to open outward for dumping outside the rails and also to open inward for dumping between the rails. Thus, it is seen that by a combination of these two operations in any selected order the car will perform the following functions:

1. Ballast material may be placed all in the center, between the rails.
2. Ballast may be placed on one or the other side, outside the rails.
3. Ballast may be placed on both sides simultaneously, outside the rail.
4. Ballast may be placed in the center between the rails and on one side or the other outside the rail at the same time.
5. Ballast may be placed in the center between the rails and on both sides outside the rails at the same time.

More operations are illustrated in the drawings shown on the next page.

The inside and outside dumping operations are controlled independently. The inside dumping is effected by means of a shaft extending crosswise of the car with a



The Car Is Designed for Unusual Flexibility of Operation

lever on each end, each of which is normally secured to the side of the car in an inoperative position, but either one of which may be used for operating the center dump. This promotes safety of operation and saves time as it is unnecessary for the operator to cross over the train. A separate lever is provided on each side for manipulating

The Material Is Dumped Uniformly in Any Quantity Desired

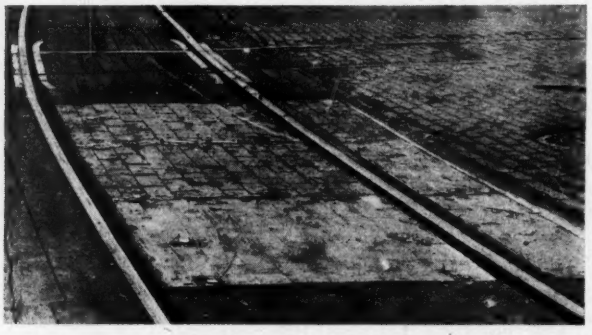
the side dump on the side on which the operator stands. The dumping is thoroughly under the control of the operator and is arranged to deposit the contents of the car in either large or small volume, as desired. The cars may be moved with entire safety while the doors are open wide.

After a protracted period of development, cars built according to this design were placed in experimental service about a year ago and have been subjected to thorough trial with various kinds of ballast material on a number of different lines and have received favorable commendation from railway officers who have studied their operation. Of particular note in this connection is the fact that a large volume of material may be deposited between the rails or outside without flooding them.

A Test of Rubber Blocks in Highway Grade Crossings

THOSE WHO have made a study of highway crossing construction may be interested in watching a unique type of crossing recently installed where the Chicago, Milwaukee & St. Paul crosses Main street in Racine, Wis. It consists of built-up sections comprising a timber base and a wearing surface of rubber blocks two inches thick. It is thought that the resiliency of the rubber will enable it to withstand the shocks from heavy traffic better than timber planks; that it will therefore have a much longer life and that it will provide easier riding for all classes of traffic. It might be compared with the popular rubber heels as used on shoes.

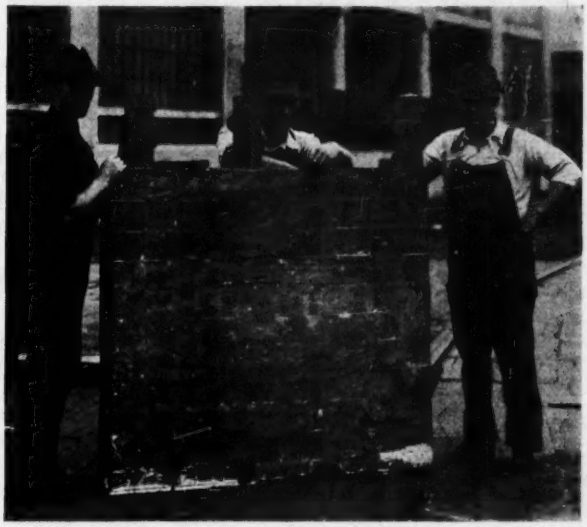
The sections between the track rails are 5 ft. long and



The Blocks Are Made of Rubber

4 ft. 4 in. wide. The base is made up of 4-in. by 6-in. planks laid flat and fastened together by one-half inch diameter rods with nuts and washers. The rubber blocks are 4⅝ in. by 11¾ in. by 2 in. thick. The lower half inch along the long sides of the block is moulded into a sinusoidal curve with alternate projections and pockets which interlock the blocks when they are placed together. Countersunk nail holes are provided in the center of the projections and the blocks are nailed to the base. The edges of the sections perpendicular to the line of traffic

are protected by means of ½-in. steel plates placed on edge and fastened to the timber base with screws. The joints between the rubber blocks and between the rubber blocks and the timber are filled with asphaltic cement. The sections are fastened to the ties with ½-in. lag screws passing through the timber base, holes being provided through the rubber blocks to permit them to be placed in the field. These holes are filled with cement after the sections are in place. Wooden filler blocks fitted in the field form a flangeway for the wheels. The sections outside the track rails are similar to the center sections except that they are only 1 ft. 3 in. wide.



The Crossing Consists of Built Up Sections

Rubber blocks of different composition have been used to determine the effect of various mixtures on the wearing qualities. The crossing was installed as an experiment by the railroad with the co-operation of the Wright Rubber Products Company of Racine. The Main street crossing was selected as a site for the experiment on account of its being a part of the Chicago-Milwaukee highway which carries an enormous traffic of vehicles of all types.

Disc Plow Cuts Weeding Costs

IN 1914 and 1915 the Fairmont Railway Motors, Inc., Fairmont, Minn., began the manufacture of a weeding machine known as the Fairmont disc weeder, to assist track forces in conducting track weeding operations. The machine consisted of a car fitted on each side with an arrangement of discs for cutting the weeds growing between the ends of the ties and the grass line and for reshaping the ballast shoulders to a desired section. Recently the manufacturer has made numerous alterations in the machine, including a re-design of the frame, a more compact transmission and the application of thrust collars on the axles.

One of the illustrations shows the newer machine removing weeds from the ballast shoulder and the other dressing up the shoulder. There are four sets of discs with two sets on each side of the car and three discs in each set. These discs are 18 in., 20 in., or 22 in. in diameter, as desired, the Canadian National using all three sizes of discs on one shaft. The discs are carried on an iron frame which is hinged to the side of the car to permit raising and lowering, which is accomplished by means of a lever on the running board, each disc set being operated independently. Aside from the lifting and lowering motion afforded, the discs may be adjusted to various angles and widths of roadbed section, the latter being done by shifting the disc shafts in their sockets. A scraper is carried immediately behind each forward disc set on each side and an arrangement of chains is also provided immediately behind the rear disc sets for dragging the ballast shoulders following the discing operation. These scrapers and chain drags may or may not be used in connection with the disc.

The motor car is of the center hung type with sufficient capacity to carry the five men necessary to conduct the weeding operations. It is equipped with a six hp. ball bearing engine sufficiently powerful to conduct any weeding operation. These operations are usually carried on at a speed of three to four miles per hour but under especially favorable conditions a speed of 12 miles per hour may be attained. The engine is of the free running type, fixed on a sliding base which permits the tightening or loosening of the transmission belt. While the car is fitted primarily for the discing operations, it is so designed as to be readily dismantled for use as a gang car capable of dragging heavy loads. One special feature of the discing mechanism is the shock-absorbing character of the levers which is secured by a spring fitted to the connecting rods between the disc carriers and the lever.

The Fairmont Disc Weeder Cutting Weeds on the Chicago, Milwaukee & St. Paul

The Disc Weeder Reshaping Shoulders on the Illinois Central

This car was used on the Yellowstone division of the Northern Pacific this year at a cost per mile of 13 cents

for gasoline, and 59 cents for wages (six laborers at 30 cents per hour) or a total of 72 cents per mile. Adding to this, $6.25 per mile for cleaning cinders from between the ends of the ties and the cutting of occasional weeds that escaped the discs (which work can be done over an entire section in from one and one-half to two days by a gang of six men) the cost amounts to $6.97 cents per mile. This compared with a cost of $10 to $15 per mile where all the work was done with shovels and hoes.

The Material Market

THE iron and steel market is still in an uncertain state. The prices of pig iron and scrap are tending downward, and orders for materials from buyers other than the railroads continue in small volume, yet there has been practically no reduction in the prices of finished materials. The volume of the rail business has been large and it is believed that the roads are now generally booked for their rail requirements for 1924, but in the field of track fastenings further orders of large volume are in sight. The structural steel business in recent weeks has been slow, bookings to the total of 120,000 tons in October representing the smallest figure since November, 1922.

PRICES IN CENTS PER POUND

	October 20		November 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	3.15	3.25	3.15	3.25
Track bolts	4.00 to 4.25	4.25	4.00 to 4.25	4.25
Angles bars	2.75	2.75	2.75	2.75
Tie Plates, steel	2.55 to 2.60	2.60	2.55 to 2.60	2.60
Tie plates, iron	....	2.85	....	2.75
Plain wire	2.75	3.19	2.75	3.19
Wire nails	3.00	3.34	3.00	3.34
Barber wire, galv.	3.80	4.14	3.80	4.14
C. I. pipe, 6 in. to 12 in., per ton	....	$57.20	....	$56.20
Plates	2.50	2.60	2.50	2.60
Shapes	2.50	2.60	2.50	2.60
Bars, soft steel	2.40	2.50	2.40	2.50

Open hearth rails per gross ton f. o. b. mill, $43.

The scrap market still shows a tendency toward weakness, although not to the same degree as in previous months. The following table shows a few minor reductions:

PRICES PER GROSS TON AT CHICAGO

	October	November
Relaying rails	$32.00 to $35.00	$32.00 to $35.00
Rails for rerolling	15.50 to 16.00	15.50 to 16.00
Rails less than 3 ft. long	17.50 to 18.00	16.50 to 17.00
Frogs and switches cut apart	14.50 to 15.00	14.00 to 14.50
Steel angle bars	16.00 to 16.50	16.00 to 16.50

The soft wood lumber market is quiet, both in the Southern pine territory and on the Pacific coast. This has had its effect upon the prices as indicated by the tables below for both Southern pine and Douglas fir, although the reductions are only moderate and are offset in a measure by increases in certain items:

SOUTHERN PINE MILL PRICES

	October	November
Flooring, 1x4, B and B flat	$44.00	$45.35
Boards, 1x8, No. 1	37.85	36.05
Dimension, 2x4, 16, No. 1, common	26.60	26.00
Timbers, 4x4 to 8x8, No. 1	29.15	30.25
Timbers, 3x12 to 12x12, rough	40.35	40.10

DOUGLAS FIR MILL PRICES

Flooring, 1x4, No. 2, clear flat	35.00	32.00
Boards, 1x6, 6x20, No. 1, common	18.50	16.20
Dimension, 2x4, 16, No. 1, common	19.50	19.50
Dimension, 2x10, 16, No. 1, common	19.50	19.50
Timbers, 6x6 to 8x8, No. 1, common	26.00	24.00
Timbers, 10x10 to 12x12, rough	25.00	26.00

There have been some moderate changes in the prices of Portland cement; the prices below are from 5 to 15 cents lower than those previously published. These figures are in carload lots per barrel, not including package:

Chicago	$2.10	Albany	$2.32
Cincinnati	2.44	Buffalo	2.48
Davenport, Iowa	2.33	New York	2.25
Minneapolis	2.42	Philadelphia	2.41
Pittsburgh	2.19	Richmond, Va.	2.47
Boston	2.63		

American Railway Engineering Association

The committee work of the association for the year is rapidly approaching completion and the reports are being finished for presentation to the association at its annual meeting next March. Two reports are now in the hands of the secretary complete for publication and portions of three additional reports have also been received.

Maintenance of Way Club of Chicago

The Maintenance of Way Club of Chicago held a meeting on November 14 at which J. R. Watt, general roadmaster of the Louisville & Nashville, presented a paper on the Operation and Maintenance of Motor Cars as supervised and directed on his road. The attendance was 76. The next meeting will be held on December 12, at which time the subject for discussion will be the track supervisor's responsibility for the maintenance of tracks owned by industries. In accordance with a decision of the club's executive committee, all meetings of this club are being held at the Auditorium hotel, Chicago, and are preceded by a get-together dinner.

Metropolitan Track Supervisors' Club

Two moving pictures were the feature of the last regular meeting of the Metropolitan Track Supervisors' Club, which was held at the Hotel Martinique, New York City, on November 10. The two pictures were presented after the luncheon and regular business meeting at which over 70 members and guests were in attendance. One of the pictures illustrated the complete details of the manufacture of shovels, showing the full process necessary in securing the material, shaping the various parts, treating the materials assembling, packing and shipping the finished product and was presented by N. E. Brookes of the Wyoming Shovel Company, Wyoming, Pa. The other feature was a two-reel picture showing the Jordan spreader at work under a wide variety of conditions. Views were given showing the spreader working on slag dumps at one of the large steel plants, cutting ditches on the New York Central and breaking out ice and snow after a severe storm on the Pennsylvania. It was presented by A. L. Greenabaum of the O. F. Jordan Company, East Chicago, Ind. A committee of 16 members was appointed with A. E. Preble, supervisor, Pennsylvania System, Paoli, Pa., as chairman, to study and report on Good Road Crossings.

The Roadmasters' Association

The Executive committee met in Chicago on Saturday, November 24, to organize the year's work and to select the committees to report at the next convention. The personnel of the committees is as follows:

Rail Laying and Ballasting Track Under Single Track Operation in Multiple Track Territory: R. H. Smith, assistant superintendent, N. & W., Roanoke, Va., chairman; W. F. Nichols, supervisor, L. V., Buffalo, N. Y.; Wm. Shea, general roadmaster, C., M. & St. P., Chicago; G. W. Kohn, roadmaster, C., R. I. & P., Joliet, Ill.; M. Regan, supervisor, C. & O., Covington, Ky.; J. A. Roland, roadmaster, C. & N. W., Missouri Valley, Ia.

Work Trains: When to Eliminate and How to Get Great-

est Efficiency: D. K. Newmyer, roadmaster, S. P., Beaumont, Tex., chairman; A. M. Clough, supervisor, N. Y. C., Batavia, N. Y.; Edw. O. Carlson, supervisor, N. Y., N. H. & H., South Braintree, Mass.; G. H. Strople, supervisor, B. & O., Callery, Pa.; L. Coffel, supervisor, C. & E. I., Momence, Ill.; P. H. Burke, roadmaster, C., B. & Q., Aurora, Ill.

Possibilities of Winter Track Work: E. C. Buhrer, supervisor, T. & O. C., Kenton, Ohio, chairman; J. J. Navin, supervisor, Penna., Chicago; L. E. Fleming, roadmaster, A., T. & S. F., Hutchinson, Kan.; Chas. Newberg, roadmaster, C. & N. W., Chicago; W. S. Fife, roadmaster, L. E. & W., Peru, Ind.; A. Solinsky, roadmaster, B. R. & P., Punxsutawney, Pa.

The Handling and Disposal of Cinders: H. R. Clark, district engineer maintenance of way, C., B. & Q., Lincoln, Nebr.; R. Q. Hamilton, assistant engineer, B. & M., St. Johnsburg, Vt.; G. G. Martin, supervisor, B. & L. E., Greenville, Pa.; W. T. Hanly, division engineer, Penna., Erie, Pa.; T. E. Bliss, assistant engineer, St. L.-S. F., Ft. Worth, Tex.; H. Ferguson, superintendent, G. T., Toronto, Ont.

Methods of Increasing the Output of Labor: W. H. Saltzman, supervisor, Penna., Ravenna, Ohio; E. Keough, assistant engineer maintenance of way, C. P., Montreal, Que.; J. W. Powers, supervisor, N. Y. C., Rochester, N. Y.; C. L. Elliot, roadmaster, St. L.-S. F., Brownwood, Tex.; J. B. Kelly, assistant general roadmaster, M., St. P. & S. S. M., Minneapolis, Minn.; Wm. A. Moberly, roadmaster, C., M. & St. P., Elgin, Ill.

American Wood-Preservers' Association

The association will hold its twentieth annual convention at the Muehlebach Hotel, Kansas City, Mo., on January 15-17. The program for the meeting is rapidly approaching completion. Among the reports of particularly timely interest which will be presented is one on "The Use of Petroleum Oil with Creosote Oil or Other Toxics," which will bring up to date the information on this subject. The Committee on the Treatment of Ties will submit a report recommending definite specifications for the treatment of ties, while the Committee on the Treatment of Timber will present similar specifications. The Committee on Track Service Records will also submit a report on the records of the test tracks on several roads. Ernest Bateman, chemist in forest products, Forest Products Laboratory, Madison, Wis., will present a paper on the "Solution of Zinc Chloride in Petroleum Oils," while J. D. MacLean, engineer in forest products at the Forest Products Laboratory, will present a paper on the effect of steam treatment on the penetration of zinc chloride, describing the results of experiments conducted at the Union Pacific timber treating plant at Laramie, Wyo. George T. Parker and H. A. Geaque of Lombard College, Galesburg, Ill., will describe a method of making the tests to ascertain the penetration of sodium fluoride.

The Nominating committee has nominated the following officers for the ensuing year: President, E. J. Stocking, vice-president, Central Creosoting Company, Chicago; first vice-president, S. D. Cooper, assistant manager treating plants, Atchison, Topeka & Santa Fe, Topeka, Kan.; second vice-president, C. F. Ford, superintendent, tie and timber department, Chicago, Rock Island & Pacific, Chicago; secretary-treasurer, P. R. Hicks, secretary-manager, service bureau, American Wood-Preservers' Association, Chicago; members of Executive Committee for three years, R. L. Allardyce, general superintendent, International Creosoting & Construction Company, Texarkana, Tex., and H. R. Condon, assistant forester, Pennsylvania, Philadelphia, Pa.; members of Nominating Committee, R. S. Belcher, manager treating plants, Atchison, Topeka & Santa Fe, Topeka, Kan.; R. C. Eggleston, forester, American Telephone & Telegraph Company, New York; L. T. Ericson, chief engineer, Jennison-Wright Company, Toledo, Ohio; C. W. Greene, timber treatment engineer, New York Central, Toledo, Ohio; F. D. Mattos, manager, treating plants, Southern Pacific, West Oakland, Cal., and H. S. Valentine, vice-president and general manager, Eppinger & Russell Company, New York.

Directory of Associations

American Railway Bridge and Building Association.—C. A. Lichty, secretary, C. & N. W. Ry., 319 North Waller Ave., Chicago. Next convention Kansas City, Mo., October 14-16, 1924. Exhibit by Bridge and Building Supply Men's Association.

American Railway Engineering Association (Works in cooperation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn St., Chicago. Annual convention, Congress Hotel, Chicago, March 11-13, 1924. Exhibit by National Railway Appliances Association.

American Wood Preservers' Association.—P. R. Hicks, secretary, Room 1146 Otis Bldg., Chicago. Next convention, January 15-17, 1924, Muehlebach Hotel, Kansas City, Md.

Bridge and Building Supply Men's Association.—John Nelson, secretary, Joseph E. Nelson & Sons, 3240 South Michigan Ave., Chicago. Exhibit in connection with annual convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers.—J. S. Penney, secretary, T. J. Moss Tie Company, St. Louis, Mo. Next convention, January 17-18, 1924, Muehlebach Hotel, Kansas City, Mo.

National Railway Appliances Association.—C. W. Kelly, secretary, People's Gas Bldg., Chicago. Annual exhibit at Coliseum, Chicago, in connection with convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—P. J. McAndrews, secretary, C. & N. W. Ry., Sterling, Ill. Next convention, Commodore Hotel, New York, September 16-18, 1924. Exhibit by Track Supply Association.

Track Supply Association.—W. C. Kidd, secretary, Ramapo-Ajax Corporation, Hillburn, N. Y. Exhibit in connection with convention of Roadmasters' and Maintenance of Way Association.

The Metropolitan Track Supervisors' Club in Session on November 10

General News

..**The Pennsylvania** is being sued for $15,000,000 by representatives of the shopmen who struck last year for alleged under-payment of wages to the members of the strikers' unions who remained at work.

The Canadian National has completed the Long Lake cut-off which connects the Canadian Northern lines in Ontario with the National Transcontinental line. This cutoff will save 70 miles between Montreal and Winnipeg and 102 miles between Toronto and Winnipeg.

The wages paid by the railways of the United States to officers and employees in 1923 will exceed $3,000,000,000, as compared with less than $1,500,000,000 in 1916, according to the reports of the Interstate Commerce Commission. Railway fuel will cost about $580,000,000 in 1923, as compared with $250,000,000 in 1916, while railway taxes will amount to about $330,000,000 in 1923, as compared with $157,000,000 in 1916.

Laws requiring all automobiles to stop before crossing railroads at grade are now on the statute books of 5 states and similar laws are in force with reference to bus lines and other carriers for hire in 16 more states. Seven other states have laws requiring automobiles to reduce speed, but not calling for a full stop. The five states having the most comprehensive stop laws are Illinois, Montana, North Carolina, Tennessee and Virginia.

Motor trucks and caterpillar tread-mounted steam shovels featured prominently in double track work undertaken this year by the Southern Pacific. On one project motor trucks were used in conjunction with the contractor's train, the arrangement being such that a revolving caterpillar shovel could reach directly across the track provided for the contractor's train and load the excavated material into motor trucks placed alongside. Much of the material handled was large rocks.

The Interstate Commerce Commission has issued a report on railroad accidents in the United States during April, May and June, 1923, which states that 500 persons were killed and 1,476 injured at highway crossings in the three months of this year, as compared with 313 killed and 946 injured in the same months last year, an increase of about 60 per cent in fatalities and 56 per cent in injured. Seventy-nine persons, including six passengers, were killed in train accidents during this quarter and 1,052 were injured.

The Southern Pacific has contracted with the Metropolitan Life Insuranc Company for a single policy amounting to about $100,000,000, for the benefit of its 90,000 employees. This policy will insure the lives of all employees who have been in the service six months or more. The initial payment will be made by the company, after which payment will be made jointly by the employee and the company. The contract will contain the usual privilege of taking out additional insurance up to a maximum of $3,500.

Charles Steinmetz, chief consulting engineer for the General Electric Company and an outstanding electrical genius, died on October 26, in Schenectady. Mr. Steinmetz was born on April 9, 1865, in Breslau, Germany, where his father was in the employ of the Government Railways. He arrived in New York at the age of 24, a political refugee, penniless and in ill health, and began his career in this country in the drafting room of Osterheld & Eickemeyer, Yonkers, N. Y. His work with the General Electric Company was almost exclusively in the nature of research work in electrical engineering, in connection with which he wrote many books dealing principally with the theory and higher mathematical phases of the subject. It has been said that his contributions to this field of engineering problems are more notable than any other engineer of this day.

An experiment of steel and copper rails is being conducted at Mount Union station on the Middle division of the Pennsylvania, where 68 tons or 113 rails of 130-lb. section containing 0.67 per cent of copper have been laid recently. These rails, which were rolled by the Carnegie Steel Company, were laid on a 1 deg. and 30 min. curve in No. 2 track just west of the station. These rails were laid with 117 comparison of the wearing qualities of the two kinds of rails can be secured. The experiment is being made to ascertain whether rails with a small percentage of copper will be more durable under the heavy main line traffic than those now in use. This entire stretch of experimental track was laid with standard L-2 splice bars and "Fair" rail anchors.

Sunday, November 18, was the fortieth anniversary of the adoption of the present system of standard time. Prior to November 18, 1883, the railroads of the country were using 49 different standards and in some of the cities three or four standards were in use at the same time on different railroads. At the present time there are only four standards for the country as a whole. The first proposal to fix standards one hour apart was laid before the railroads in 1869, but nothing was done until 1883, when the plan of William F. Allen, secretary of the General Time convention of the American Railway Association, was adopted.

The proposal by the New York Central that the Central of New Jersey, together with the Catawissa branch of the Philadelphia & Reading, making a line from Williamsport, Pa., to Jersey City, should be allocated in the general consolidation plan to the New York Central in order that it might be connected up into a trunk line to the west by way of the New York Central's Clearfield route and Ashtabula, Ohio, is being strenuously opposed by the Baltimore & Ohio which proposes as a substitute a route from New York to Williamsport, Pa., by way of the Jersey Central and the Reading, and the lines of the Pennsylvania and the Buffalo, Rochester & Pittsburgh from Williamsport to Butler, Pa., where a connection could be made with the Baltimore & Ohio for Chicago, forming a line 900 miles long from New York to Chicago, as compared with the distance of 923 miles by way of the Clearfield route, as proposed by the New York Central and 979 miles by way of the present New York Central main line, and with its summit 200 ft. lower.

Results of the Pennsylvania Annual Inspection

The annual award of prizes to supervisors and assistant supervisors on the main line divisions of the Eastern region of the Pennsylvania was made as follows: The principal, or Klondike prize, which is given for maintaining the best line and surface between New York and Altoona, and between Philadelphia and Washington, was awarded to Raymond Swenk, supervisor, and J. B. Otto, Jr., assistant supervisor, in subdivision No. 33, of the Philadelphia division, at Middletown, Pa. This prize amounts to $1,200, of which the supervisor receives $800 and the assistant supervisor $400. The prize for the greatest improvement made during the year in line and surface, amounting to $1,000, was awarded to R. G. Ford, supervisor on the Maryland division, at Newark, Del. The supervisor's share of this prize is $700, and his

assistant's $300. Three additional prizes of $800 each, $600 for the supervisor and $200 for his assistant, were awarded to L. S. C. Pie, supervisor, and C. W. Van Nort, former assistant supervisor on subdivision No. 3 of the New York division, at New Brunswick, N. J.; J. D. Lovell, supervisor, and R. H. Crew, assistant supervisor, division No. 44, of the Middle division, at Huntingdon, Pa., and E. L. Koch, supervisor, and E. L. Smith, assistant supervisor, on subdivision No. 81 of the Maryland division, at Chester, Pa.

The general manager's track inspection on the Southwestern region of the Pennsylvania, which took place on October 29 to 31, resulted in the awarding of the first prize of $200 to B. J. Boyle, supervisor of subdivision No. 2, of the St. Louis division, with headquarters at Terre Haute, Ind.; the second prize of $150 to M. E. Boyle, supervisor of subdivision No. 3, of the St. Louis division, with headquarters at Greeneville, Ill.; and third prize of $100 to H. Rice, supervisor of subdivision No. 2, of the Louisville division, with headquarters at Urbana, Ohio. Prizes of $50 were also awarded to the track foremen having the best section on each supervisor's subdivision. Comparisons were made on the basis of general conditions.

Prizes of $250, $200 and $150, respectively, were awarded to Charles McCarthy, supervisor on the Logansport division of the Northwestern region, with headquarters at Union City, Ind.; J. H. Britton, also on the Logansport division, with headquarters at Logansport, Ind.; and H. D. Sutherlin on the Ft. Wayne division for the best, second best and third best main line subdivisions in the Northwestern region, as a result of the general manager's annual track inspection held in October. The winning sections were selected by a committee, headed by T. J. Skillman, chief engineer maintenance of way of the Northwestern region, on a basis of points scored. These same subdivisions and supervisors, with the exception of Supervisor Sutherlin, were awarded the similar prizes at the conclusion of the 1921 inspection. Prizes of $50 were also awarded the foremen whose sections received the highest rating on each supervisor's subdivision.

Delaware, Lackawanna & Western Track Awards

The Lackawanna inspection followed the same general lines, both in regard to methods and the awarding of the prizes as in the past. First prize foremen received $100 in cash, a silver medal and a marker for the section, while second prize men received $50 and a silver medal. The efficiency men received an efficiency sign, a marker for the section and $10 per month increased compensation in connection with their salary and remain in this list as long as their sections are held up to the same high standard.

The following men were successful on the different divisions:

Morris & Essex division, east end: First prize, Jos. Venezia, Secaucus, N. J.; second prize, John Worzell, Denville, N. J.

Morris & Essex division, west end: Efficiency, Eugene Morgan, Blairstown, N. J., and Peter Tozzi, Portland, Pa.; first prize, Jos. Morgan, Johnsonburg, N. J.; second prize, A. Perfetti, Blairstown, N. J.

Main line division, southern: Efficiency, Wilson Sutton, Mt. Pocono, Pa., and John Kocella, Pocono Summit, Pa.; first prize, John McDonald, Elmhurst, Pa.; second prize, John Wilcox, Portland, Pa.

Main Line division, northern: Efficiency, John Fernan, New Milford, Pa.; first prize, Angelo Scott, Kingsley, Pa.; second prize, F. Brown, Foster, Pa.

Buffalo division, east end: Efficiency, J. Green, Savona, N. Y., and T. Carey, Painted Post, N. Y.; first prize, Jas. Romeo, Apalachin, N. Y.; second prize, A. Gliserene, Bath, N. Y.

Buffalo division, west end: Efficiency, J. C. Keating, Wallace, N. Y.; first prize, J. Morgan, Avoca, N. Y.; second prize, H. Miles, Kanona, N. Y

Bloomsburg division: Efficiency, R. Shingler, Espy, Pa.; D. Blizzard, Danville, Pa., and G. Thomas, Shickshinny, Pa.; first prize, L. Miller, Northumberland, Pa.; second prize, F. Pignono, Wyoming, Pa.

Syracuse division: First prize, L. Warner, Chenango Forks, N. Y.; second prize, F. Cipriani, Homer, N. Y.

Utica division: Efficiency, Jos. Moran, North Brookfield, N. Y.; first prize, W. Locantro, Sherburne, N. Y.; second prize, Fred Julian, Bridgewater, N. Y

Personal Mention

General

E. M. Durham, Jr., who has been in charge of the Department of Ways and Structures in the Railroad Administration, has also been appointed director of the division of Liquidation of Claims, with office at Washington, D. C., succeeding E. M. Alvord, deceased.

George LeBoutillier, vice-president of the Long Island and an engineer by education and early experience, who was reported in the November issue as having been elected president to succeed Ralph Peters, has not been elected to this office, although he has been acting as president since the death of Mr. Peters. The announcement of his election was premature.

Changes on the Pennsylvania

Elisha Lee, vice-president of the Eastern region of the Pennsylvania System, with headquarters at Philadelphia, Pa., and a former engineering officer, has been transferred to the Central region, with headquarters at Pittsburgh, Pa., succeeding **James A. McCrea**, deceased. This change resulted in the promotion of a number of other officers of engineering and maintenance of way training. **C. S. Krick**, general manager of the Eastern region, with headquarters at Philadelphia, has been promoted to vice-president, succeeding Mr. Lee. **R. V. Massey**, assistant general manager of the Eastern region, with headquarters at Philadelphia, has been promoted to general manager, with the same headquarters. **C. I. Leiper**, general superintendent of the New Jersey division, with headquarters at New York City, has been promoted to assistant general manager, succeeding Mr. Massey. **J. B. Hutchinson, Jr.**, general superintendent at Grand Rapids, Mich., has been promoted to assistant to general manager at Chicago. **J. C. McCullough**, general superintendent of the Eastern Ohio division, with headquarters at Pittsburgh, has been appointed assistant to the general manager of the Central region, with the same headquarters. **J. O. Hackenberg**, superintendent of the Buffalo division, with headquarters at Buffalo, N. Y., has been transferred to the Philadelphia Terminal division, with headquarters at Philadelphia, succeeding **H. H. Garrigues**, who has been promoted to general superintendent of the Illinois division, with headquarters at Chicago, in place of **W. B. Wood**, who has been transferred to the New Jersey division, with headquarters at New York, succeeding Mr. Leiper, **D. Y. Geddes**, superintendent of the West Jersey and Seashore, has been transferred to the Philadelphia division, succeeding **W. L. Ekin**, who has been promoted to general superintendent of the Northern division, with headquarters at Buffalo, N. Y. **N. B. Pitcairn**, division engineer of the New York division, with headquarters at Jersey City, N. J., has been promoted to superintendent of the Norfolk division, with headquarters at Cape Charles, succeeding **F. D. Davis**, who has been transferred to the New York division. **J. H. Redding**, superintendent of the Erie & Ashtabula division, has been transferred to the Eastern division of the Central region, with headquarters at Pittsburgh, Pa. **C. O. Long**, supervisor at Phillipsburg, N. J., has been promoted to assistant freight trainmaster of the New York division.

Norman B. Pitcairn was born at Harrisburg, Pa., on November 8, 1881, and was graduated from Princeton University as a civil engineer in 1903. He entered railway service on June 29, 1901, as a rodman in the engineering department of the Pennsylvania, remaining in this position until July 1, 1904, when he was promoted to transitman. On June 1, of the following year he was promoted to assistant supervisor of track, serving in this capacity until February 1, 1910, when he was promoted to supervisor of track, a position he held at various points on the system until November 10, 1919, when he was promoted to division engineer of the Conemaugh division, with headquarters at Pittsburgh. In May, 1920, Mr. Pitcairn was transferred to the Middle division, with headquarters at Altoona, Pa., and on July 1, 1922, he was again transferred, this time to the New York division, with headquarters at Jersey City, N. J., the position

which he held at the time of his recent promotion to superintendent of the Norfolk division.

Charles S. Krick was born at Reading Pa., on March 16, 1866, and was graduated from Lafayette College in 1887. Shortly after his graduation he entered railway service as a rodman on the Pennsylvania, following which he was consecutively rodman, assistant supervisor and supervisor, until January 1, 1903, when he was promoted to assistant engineer. In 1900 he was promoted to principal assistant engineer and in 1907 to division superintendent, remaining in that capacity until November 6, 1915, when he was promoted to general superintendent of the New Jersey division. In 1918 he was promoted to assistant general manager, Lines East, and on March 1, 1920, he was promoted to general manager of the Eastern region, which position he held at the time of his recent election as vice-president.

Charles S. Krick

C. I. Leiper was born at Wallingford, Pa., on October 28, 1874, and graduated from Swarthmore College in 1895, after which he studied at the University of Pennsylvania, entering the service of the Pennsylvania in 1897 in the construction department. He became transitman in February, 1901, and the following March was made assistant supervisor on the Maryland division. He was promoted to supervisor on the same division in 1903, and later served as supervisor on the Pittsburgh and the New York divisions. In August, 1909, he was promoted to division engineer on the Manhattan division and was later transferred to the New York division. He was made principal assistant engineer of the Philadelphia, Baltimore & Washington on June 16, 1913, and the following February was promoted to superintendent of the New York, Philadelphia & Norfolk, at Cape Charles, Va. He was promoted to general superintendent in February, 1920, which position he was holding when promoted to assistant general manager of the Eastern region.

C. I. Leiper

H. H. Garrigues was born on September 4, 1881, at Harrisburg, Pa., and entered railway service in February, 1901, immediately after graduating from Harverford College, as a rodman on the Pennsylvania. He was promoted to transitman at Altoona, Pa., in September, 1903, and in January, 1904, became assistant supervisor in the office of the general superintendent at Altoona, a position he held at several points until December, 1908, when he was promoted to supervisor. He served successively as supervisor of the Allegheny division, the West Jersey & Seashore, in the office of the general manager, in the office of the valuation engineer, on the Baltimore division and on the Philadelphia division until December, 1917, when he was promoted to division engineer of the Trenton division. He was transferred to the Philadelphia Terminal division in January, 1919, and in March, 1920, was promoted to engineer maintenance of way of the Southern division. He became a superintendent in May, 1920, and in May, 1923, was transferred to the Philadelphia Terminal division, which position he was holding at the time of his recent promotion to general superintendent of the Illinois division, with headquarters at Chicago.

Wm. L. Ekin was born on September 18, 1879, at Xenia, Ohio. He received his engineering education at the Case School of Applied Science and entered railway service on July 16, 1900, in the maintenance of way department of the Pennsylvania, holding various positions until September 1, 1905, when he was promoted to assistant engineer of the Michigan division. On May 1, 1907, he was promoted to division engineer on the same division. He was later transferred to the St. Louis division, with headquarters at Terre Haute, Ind., where he remained until February 11, 1918, when he was promoted to superintendent of the Peoria division, with headquarters at Decatur, Ill. He was transferred to the Michigan division on July 1, 1918, to the Conemaugh division on March 1, 1920, and to the Philadelphia division on March 1, 1923, where he served until his recent promotion to general superintendent of the Northern division, with headquarters at Buffalo, N. Y.

Wm. L. Ekin

Engineering

C. D. Johnson has been appointed division engineer of the Alamosa division of the Denver & Rio Grande Western, with headquarters at Alamosa, Colo. **G. Darby** has been appointed division engineer of the Gunnison division, with headquarters at Gunnison, Colo.

C. M. Barbour, assistant engineer in the office of the electrical engineer of the Southern Pacific, with headquarters at San Francisco, Cal., has been promoted to assistant engineer in the office of the chief engineer of the lines in Texas and Louisiana, with headquarters at Houston, Tex.

Roy D. Whyman, division engineer on the Amarillo division of the Atchison, Topeka & Santa Fe, has been transferred to the Western division at Dodge City, Kan., to succeed **Arnold B. Truman,** who has been transferred to the New Mexico division at Las Vegas, N. M., in place of **John A. Roach,** who has been transferred to the Plains division at Amarillo, Tex. As Mr. Roach is now on leave of absence, his place is being filled temporarily by **H. O. Wagner,** formerly roadmaster at Wellington, Kan.

W. F. Turner, division engineer of the Tuscon division of the Southern Pacific, with headquarters at Tucson, Ariz., has been transferred to the Sacramento division, with headquarters at Sacramento, Cal., succeeding **E. E. Mayo,** who has been transferred to the construction department. **P. T. Robinson,** division engineer of the East Bay electric division, with headquarters at Oakland, Cal., has been transferred to the Tucson division, succeeding Mr. Turner. **W. H. Phelps,** assistant division engineer of the Coast division, with headquarters at San Francisco, Cal., has been promoted to division engineer of the East Bay electric division, succeeding Mr. Robinson.

J. H. Cooper, supervisor on the Pennsylvania, with headquarters at New York, has been promoted to division engineer of the Philadelphia division, with headquarters at Harrisburg, Pa., to succeed **R. C. Miller,** who has been transferred to the New York division in place of **N. B. Pitcairn,** who has been promoted to superintendent of the Norfolk division, as noted elsewhere in these columns. **E. O. Wood,** assistant division engineer, at Pittsburgh, Pa., has been promoted to division engineer with headquarters at Buffalo, N. Y.

E. F. Manson, whose promotion to division engineer on the Chicago, Rock Island & Pacific, with headquarters at Fairbury, Neb., was announced in the November issue, was born

at Milwaukee, Wis., on February 15, 1879, and was graduated from Northwestern University in 1906. He entered railway service on October 1, 1906, as an engineering apprentice in the service of the Illinois Central and on April 1, 1907, became a rodman on the S. P. & D. M., where he was employed as rodman, draftsman and assistant engineer until November 1, 1909. He returned to the Illinois Central at this time as a draftsman and continued as a draftsman and instrumentman until May 25, 1911, when he entered the service of the Rock Island. He was employed as assistant engineer until March 9, 1913, thereafter as office engineer for the engineer maintenance of way of the First district until August 21, 1915, and then as pilot engineer in a structural party until September 1, 1916, when he was appointed master carpenter on the Minnesota division. On February 15, 1920, he was promoted to special engineer, reporting to the chief engineer, and continued in this capacity until his present appointment as division engineer.

A. W. Johnson, whose promotion to supervisor of water service of the Eastern lines of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan., was announced in the October issue, was born on November 8, 1894, at Topeka, Kan., and entered railway service in 1904 as a chainman on the Atchison, Topeka & Santa Fe. He was engaged as a chainman and rodman until 1916, when he entered the chief engineer's office as a draftsman, meanwhile undertaking the Kansas University extension course in engineering. He was promoted to assistant engineer in November, 1919, and was employed in this capacity at the time of his recent promotion to supervisor of water service.

M. S. Miller, supervisor of track on the Philadelphia & Reading with headquarters at Philadelphia, Pa., has been promoted to division engineer with headquarters at Harrisburg, Pa., succeeding **W. R. Dunn,** who has been transferred to Tamaqua, Pa., in place of **N. W. H. Shafer, Jr,** who was transferred to Philadelphia to succeed **J. C. Wrenshall, Jr.,** who has been promoted to engineer maintenance of way, vice **F. S. Stevens,** who has retired.

John C. Wrenshall, Jr., was born at Baltimore, Md., on August 12, 1868. He was graduated from the University of Virginia in 1890, entering railway service in September of that year in the engineering department of the Virginia & Kentucky railway. In June, 1891, he entered the service of the Baltimore & Ohio, subsequently being promoted to assistant supervisor, supervisor and division engineer. In 1900, he left the employ of that road to enter the service of the Philadelphia & Reading in the engineering department, being later appointed supervisor at Lebanon, Pa., and subsequently transferred to Harrisburg, Pa., and Trenton Junction, N. J. On October 17, 1905, he was promoted to division engineer at Harrisburg, being transferred to Philadelphia on September 7, 1918, where he remained until his promotion to engineer maintenance of way with headquarters at Reading, Pa.

John C. Wrenshall, Jr.

M. S. Miller was born at East Greenbush, N. Y., on October 22, 1886. He was graduated from Rensselaer Polytechnic Institute in 1909, when, after working for a short time as a draftsman for the American Bridge Company, he entered railway service as a rodman in the chief engineer's office of the Philadelphia & Reading in November, 1909. In December, 1910, he was promoted to assistant supervisor of track with headquarters at Harrisburg, Pa., being transferred to the Atlantic City Railroad with headquarters at Camden, N. J., in March, 1911. In May, 1914, he was promoted to supervisor at Mahanoy Plane, Pa., where he remained until October, 1920, when he was transferred to Philadelphia, Pa., where he remained until the time of his promotion to division engineer.

F. S. Stevens was born on December 7, 1850, at Athens, Pa., and received his engineering education at Cornell University. He entered railway service on March 13, 1870, and subsequently to 1877 was chief engineer, locating engineer and superintendent of construction on a number of small railroads and engineer maintenance of way of the New York, Ontario & Western until 1883 when he was appointed assistant division engineer of the New York, West Shore & Buffalo. He became principal assistant to the chief engineer in 1884, and in 1886 was appointed engineer maintenance of way of the Cortland & Northern and the Canastota & Northern, remaining with these railroads until January 1, 1887, when he was appointed division engineer of the Philadelphia & Reading. In October, 1900, he was promoted to superintendent of the Reading & Lebanon divisions with headquarters at Reading Pa., and continued in this capacity at Reading and elsewhere until his promotion to engineer maintenance of way in 1905.

F. S. Stevens

P. L. Barker, supervisor of bridges and buildings on the New York Central, with headquarters at Watertown, N. Y., has been promoted to division engineer with headquarters at Oswego, N. Y., succeeding **N. W. McCallum,** who has been transferred to New York City, in place of **Francis Boardman,** promoted to manager of buildings, Grand Central Terminal. Mr. Barker was born at Mason, N. H., on August 30, 1870, and was educated at the New Hampshire University and the Thayer School of Engineering at Dartmouth, receiving his Civil Engineering degree at the latter place in 1894. He entered railway service in February, 1901, as an assistant engineer on the Pennsylvania division of the New York Central. In 1904 he was promoted to supervisor of bridges and buildings on the same division, remaining in this position until 1918 when, during government control, he was appointed assistant engineer of bridges and buildings of the corporate lines. In 1920, he was appointed supervisor of bridges and buildings on the St. Lawrence division, the position he held at the time of his promotion to division engineer as noted above.

Track

Fred McCarty has been promoted to district roadmaster on the Dakota division of the Great Northern, with headquarters at Devils Lake, N. D., to succeed **M. Fahey,** resigned.

M. C. Wardwell, formerly assistant to chief engineer of the Mississippi Central, has been appointed acting roadmaster with headquarters at Hattiesburg, Miss., to succeed **M. Rowan,** whose death was reported in the November issue.

H. E. White has been appointed roadmaster on the Syracuse division of the Delaware, Lackawanna & Western with headquarters at Syracuse, N. Y., succeeding **Daniel Harley,** who has retired.

William Chauvenet has been promoted to assistant supervisor on the Pennsylvania, with headquarters at Parkton, Del., to succeed **F. R. Hursh,** who has been transferred to Newark, Del., vice **N. M. Lawrence,** who has been promoted to supervisor, with headquarters at Lock Haven, Pa., in place of **E. R. Parke,** transferred. **L. E. Pilot** has been promoted to assistant supervisor at Lock Haven, to succeed **T. B. Williams,** who has been transferred to Baltimore in place of **J. M. Fox,** promoted to supervisor at Barnesboro, Del., to succeed **R. Woodcock,** transferred to Trenton, N. J., in place of **M. De K. Smith,** transferred to Phillipsburg, where he succeeds **C. O. Long,** promoted to assistant freight trainmas-

ter. **Joseph C. Groft,** rodman on the Pittsburgh division of the Pennsylvania, has been appointed acting assistant supervisor of track of the Monongahela division, with headquarters at West Brownsville, Pa., and **A. P. Haines** has been promoted to acting assistant supervisor on the Cincinnati division, with headquarters at Cincinnati, Ohio.

P. G. Jefferies, assistant supervisor of track on the Philadelphia & Reading, with headquarters at Lansdale, Pa., has been promoted to supervisor with headquarters at Reading, Pa., succeeding **O. H. Rhoads** transferred to Coatesville, Pa., in place of **A. P. Crosley,** transferred to Philadelphia, vice **M. S. Miller,** promoted to division engineer, as noted elsewhere. **S. V. Keeler,** assistant supervisor on the New York division, with headquarters at Philadelphia, was transferred to Lansdale in place of **Mr. Jeffries** and was succeeded by **G. N. Ewing,** assistant supervisor at Tamaqua, Pa.

P. R. Bickford, assistant supervisor of track on the Philadelphia & Reading, with headquarters at Trenton Junction, N. J., has been promoted to supervisor of track with headquarters at Olney, Pa., succeeding **F. W. Biltz,** who has been transferred to Mahanoy Plane, Pa., succeeding **R. F. Wood,** who has resigned. **S. R. Miller,** assistant supervisor at Reading, Pa., was transferred to Trenton Junction, in place of **Mr. Bickford** and was succeeded by R. Westcott, assistant supervisor at Harrisburg, Pa.

Mr. Bickford was born at Mt. Holly, N. J., on November 3, 1890, and was graduated from Princeton University in civil engineering in 1911. He entered railway service in the valuation department of the Pennsylvania System on September 1, 1916, where he remained until September 1, 1917, when he entered the service of the Philadelphia & Reading, where he was employed in the controller's office. On November 1, 1918, he was promoted to assistant supervisor of track, remaining in this position until June 1, 1919, when he was appointed inspector in the safety department. On April 1, 1920, he was reappointed assistant supervisor of track, this time on the Reading division, where he served until July 1, 1922, when he was transferred to the New York division with headquarters at Trenton Junction, the position he held at the time of his recent promotion.

C. W. Ayling has been promoted to roadmaster on the Southern Kansas division of the Atchison, Topeka & Santa Fe, to succeed **E. G. Buchanan,** assigned to other duties. **A. N. Ferguson** has been promoted to roadmaster on the same division, with headquarters at Independence, Kan., to succeed **L. Holland,** also assigned to other duties.

Mr. Ayling was born on September 19, 1889, at Iola, Kan., and entered railway service as a track laborer on the Atchison, Topeka & Santa Fe on May 17, 1907. He was promoted to section foreman on July 5, 1909, and continued in that capacity until April 8, 1918, when he joined the 45th Engineers, U. S. Army, as a member of which he was associated with the building of a military railroad from Acotink, Va., to Camp Humphreys, Va., from April 21, 1918, to July, 1918, and had charge of yards at Gonges, France, from August 1, 1918, to June 1, 1919. Upon his discharge from military service on July 23, 1919, he re-entered the service of the Atchison, Topeka & Santa Fe as a section foreman and was serving in this capacity at the time of his recent promotion to roadmaster.

Mr. Ferguson was born on October 17, 1888, at Williamsburg, Iowa, and entered railway service on July 5, 1900, as an extra gang water boy on the Chicago & North Western. He was employed as a section laborer during the summers of 1903 and 1904, and in 1905 was promoted to section foreman at Buxton, Iowa. In the following year he was employed as a car repairer at No. 10 Junction, Iowa, but retransferred to the track department as a section foreman in 1907, serving at No. 10 Junction and Buxton until 1909, when he went to Oklahoma. Entering the service of the Atchison, Topeka & Santa Fe on February 7, 1910, as assistant extra gang foreman, he was employed as assistant extra gang foreman until March 1, 1910, when he became section foreman. He served as section foreman until October 1, 1911, and then as extra gang foreman until January 1, 1912, when he became fence gang foreman. He resumed work as section foreman at Navina, Okla., in 1914, and was extra gang foreman on the Oklahoma division continuously thereafter until his recent promotion to roadmaster at Independence, Okla., except for a short period when he was section foreman at Cushing, Okla.

M. Dodd, assistant roadmaster on the Michigan Central, with headquarters at Vassar, Mich., has been promoted to roadmaster, with the same headquarters and jurisdiction, to succeed **P. Margraf,** who has been transferred to Michigan City, Ind., with jurisdiction between Michigan City and Chicago, to succeed **G. W. Grafford,** who has been transferred to the Michigan City-Niles division, with the same headquarters, to succeed **N. McNabb,** who has retired after continuous service of 47 years with the Michigan Central.

E. Sargent, one of the oldest employees in point of service on the Michigan Central and for many years roadmaster on the Mackinaw division, with headquarters at Cheboygan, Mich. was also recently retired after 47 years' continuous service. Mr. Sargent was born in Michigan on September 25, 1853, and entered railway service as early as 1873 as a water boy on a wood burning train on the Air Line division of the Michigan Central. He continued as a water boy and as a section laborer until 1876 when he became foreman of the yard at Saginaw, Mich. He was transferred to the Mackinaw division in 1880 and in 1883 was promoted to foreman in charge of work incident to the building of the branch lines into the timber regions. He was promoted to assistant to the roadmaster in 1893 and in 1898 became roadmaster of the north end of the Mackinaw division. He was transferred to the south end in 1916, where he remained until his recent retirement. Mr. Sargent has the distinction of being foreman on the first logging road built north of Pinconning by the Michigan Central.

Bridge and Building

D. E. Sauer has been appointed assistant master carpenter on the Ft. Wayne division of the Pennsylvania, Northwestern region, with headquarters at Ft. Wayne, Ind.

J. K. Bonner, assistant supervisor of bridges and buildings on the New York Central, with headquarters at Rochester, N. Y., has been promoted to supervisor of bridges and buildings with headquarters at Watertown, N. Y., succeeding **P. L. Barker** promoted to division engineer as noted elsewhere.

Francis Boardman, whose promotion to manager of buildings of the Grand Central Terminal of the New York Central at New York, is noted elsewhere in these columns, was born at Rutland, Vt., in 1875, and was graduated from Yale in 1897, taking a post-graduate course in civil engineering, at Columbia University, from which he was graduated in 1899. Following this, he was employed in various railroad engineering and construction work in Michigan and West Virginia, entering the service of the New York Central as a rodman in the engineering department at Buffalo, N. Y., in 1902. He was subsequently promoted to assistant engineer, supervisor of track, designing engineer and division engineer, the position he held at the time of his promotion to manager of buildings.

Thomas Stang, whose promotion to supervisor of bridges and buildings on the Northern Pacific was announced in the October issue, was employed in the Northern Pacific offices in St. Paul from 1898 to 1910, becoming associated with bridge construction work in the field. He then entered the field and was employed on bridge construction here and there on the Northern Pacific, including such jobs as the Point Defiance line in Washington in 1913 and 1914, and the Spokane grade separation in 1914 and 1915, until 1920, with the exception of two years, when he was employed as a field man on bridge valuation. In 1920 he became assistant supervisor of bridges and buildings at Jamestown, N. D., and was employed in this capacity until his recent promotion to supervisor of bridges and buildings at Jamestown, N. D., upon the retirement of F. Ingalls.

P. P. Lawrence, whose promotion to superintendent of bridges and buildings on the Lake Erie & Western, with headquarters at Tipton, Ind., was announced in the October issue, was born on November 20, 1865, at Franklin, W. Va., and is a graduate of the course in engineering with the American Correspondence School. He entered railway service on July 5, 1888, as a bridge carpenter on the Lake Erie & West-

ern and was a bridge carpenter until January 1, 1897, when he was appointed bridge foreman. He served as bridge foreman until March 3, 1912, when he was promoted to assistant supervisor of bridges and buildings, the position he held until his recent promotion to superintendent.

Purchases and Stores

W. C. Bower, assistant manager of purchases and stores of the New York Central Lines with headquarters at New York, has been appointed manager of purchases and stores with the same headquarters, succeeding S. B. Wight, promoted to assistant to the president.

H. A. Smith, general storekeeper of the Terminal Railroad Association of St. Louis, with headquarters at St. Louis, Mo., has been promoted to purchasing agent and general storekeeper, with the same headquarters, succeeding W. G. O'Fallon, who has resigned to engage in private business.

Obituary

Colonel Henry Haines, former president of the American Railway Association, a prominent railway engineering and operating officer for 20 years and an author of numerous works on railroads, died at his home in Lenox, Mass., on November 3 at the age of 87 years. Col. Haines began his railroad service about 1853, and was chief engineer of the Charleston & Savannah for six years. During the Civil war he was an officer in the Confederate army, having charge of its transportation service. He was vice-president of the American Society of Civil Engineers from 1901 to 1902.

H. R. Carpenter, assistant chief engineer of the Missouri Pacific, with headquarters at St. Louis, Mo., died suddenly on November 12 when leaving his home for the office. Mr. Carpenter pursued his engineering studies at Yale university and entered railway service in 1885 as a rodman on the Union Pacific. He became an assistant engineer on the Western Pacific in 1887, and served in this capacity on surveys, construction and reports until 1892, when he was appointed engineer in charge of location and construction on the Denver & Rio Grande. He left railway service in 1895 to engage in private practice, but returned in 1899 as chief engineer of the Colorado Springs and Cripple Creek District railroad. He re-entered private practice in 1903, in which he was engaged until 1905, when he again re-entered railway service, this time as assistant engineer on location on the Missouri Pacific. He served in this capacity on location and construction until 1912, when he was promoted to engineer maintenance of way, serving in this capacity until 1915, when he became assistant chief engineer. During federal control he was chief engineer of the Southern lines of that road, a position he held until 1920, when he returned to his position of assistant chief engineer.

B. J. Dalton, who was chairman of the valuation committee of the Missouri-Kansas-Texas from March 1, 1916, to July 31, 1920, died at Parsons, Kansas, on October 28. Mr. Dalton was born at Franklin, Ky., on May 20, 1865, and was graduated from the University of Kansas in 1890. His first railway experience was as a rodman on construction on the Missouri Pacific in 1887. After leaving college he became a transitman on construction for the Union Pacific and in 1891 entered the service of the Texas, Louisiana & Eastern (now a part of the G. C. & S. F.) as resident engineer. In 1893-94 he was engaged in a preliminary survey for 100 miles of projected line in Colorado; then for a brief period he was engaged in private practice. From 1895 to 1898 he was division engineer of construction for the Kansas City, Pittsburg & Gulf (now Kansas City Southern). He was appointed chief engineer of the Kansas, Oklahoma Central & South Western in 1898, and in 1900 became assistant chief engineer of the St. Louis & North Arkansas and the Arkansas & Choctaw (St. L.-S. F.). From 1903 to 1905 he was city engineer at Lawrence, Kansas, and then for a year was chief engineer of the Denver, Enid & Gulf (now a part of the A., T. & S. F.). In 1906 he was appointed associate professor of civil engineering and professor of railway engineering at the University of Kansas and held that position until 1914. During this period he served also with the Kansas Public Utilities Commission. In 1914 he was appointed assistant division engineer, division of valuation, Western district, Interstate Commerce Commission, with headquarters at Kansas City, Mo., and held that position until his appointment as chairman of the valuation committee of the Missouri-Kansas-Texas in 1916.

George W. Andrews, assistant to the chief engineer, maintenance, of the Baltimore & Ohio, with headquarters at Baltimore, Md., and an employee of the company for 43 years, died from a stroke on November 2. Mr. Andrews was born at Laurel, Md., on June 1, 1856, and entered railway service during the winter of 1873 as a temporary baggage master on the Baltimore & Ohio at Relay, Md. He left railway service two months later to become an apprentice at house carpentering at Baltimore, upon the completion of which, in 1876, he was employed by various contractors until 1880, when he re-entered the service of the Baltimore & Ohio, as a carpenter. In May, 1883, he again left railway service but as the result of a circumstance which brought him in contact with the then president of the Baltimore & Ohio he again re-entered service on the Baltimore & Ohio, this time in the fall of 1885, as an assistant to the superintendent of construction of the Philadelphia division and the New York terminal. On March 1, 1887, he became supervisor of bridges and buildings between Philadelphia, Pa., and Baltimore, Md., with his jurisdiction successively extended until on March 15, 1902, when he was promoted to assistant engineer bridges and buildings of the system. On December 1, 1903, he was made inspector of maintenance and served in this capacity until December 1, 1911, when he was promoted to assistant to the engineer maintenance of way, which title was changed on January 1, 1920, to assistant to chief engineer, maintenance, with jurisdiction over the maintenance of bridges, buildings, docks, wharves, scales and tunnels of the system. Mr. Andrews was active in association work, being a charter member of the American Railway Bridge and Building Association, of which organization he was president in 1894-95.

George W. Andrews

A new program for continuing during the coming year the efforts of the railroads to increase transportation facilities and to provide adequate transportation to the public, was adopted by the railroads at a meeting of the member roads of the American Railway Association and the Association of Railway Executives in New York, on November 8, where the executives of 94 railroads, representing 95 per cent of the total Class 1 railroad mileage, were present. Statistics were made public which show that record breaking expenditures for equipment and other facilities and for materials and supplies have been made in 1923. The capital expenditures for equipment and permanent improvement, according to the reports received at the meeting from the individual railroads, totaled $429,272,836 in 1922 and will aggregate $1,059,440,000 in 1923. In addition there will be carried over into 1924, appropriations made this year for similar capital expenditures amounting to $243,804,000, making a grand total of $1,732,516,836 expended or authorized for capital improvements during 1922 and 1923. This does not include the appropriations which will be made in budgets for next year and which still remain to be approved by the individual railroads. In addition to the above capital expenditures for increasing their facilities, the Class 1 railroads will expend approximately $1,800,000,000 for fuel, materials and supplies for current operation and maintenance in 1923.

Construction News

The Arkansas & Louisiana Missouri plans the construction of a freight station at Monroe, La., to cost $25,000.

The Arkansas Short Line has been refused authority by the Interstate Commerce Commission to construct a line from a connection with a logging road at McCormick, Ark., to a connection with the Missouri Pacific at McDonald, Ark., and the operation in interstate commerce of the entire line from Truman to McDonald, 32.6 miles.

The Atchison, Topeka & Santa Fe has awarded a contract to the Swenson Construction Company, Kansas City, Mo., for the construction of a ten-story reinforced concrete office building at Topeka, Kan., to cost about $900,000. It closed bids on November 19 for the construction of a brick lavatory building at Argentine, Kan., to cost approximately $50,000, and has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of an apprentice school building at San Bernardino, Cal., to cost $30,000.

This company has authorized the construction, in 1924, of the following units in expansion of the terminal facilities at San Bernardino, Cal.: A boiler shop with tank shop and stripping pit, 600-ft. by 160-ft., to cost $900,000, with mechanical equipment; the extension of the erecting bay of the locomotive shop; the installation of a new transfer table; the extension of the present machine shop, 200-ft. by 196-ft. Of the appropriation of $2,800,000, $600,000 will be spent this year.

This company has completed surveys for the contemplated four-mile extension from Tonkawa, Okla., to the Three Sands oil fields to cost $100,000 and contemplates the construction of second track from Summit, Cal., to Hicks, a distance of 44 miles.

The Baltimore & Ohio has closed bids for the construction of buildings, tank foundations and pipe installations for water treating plants at North Dayton, Ohio, East Dayton and Sidney. The company has also awarded a contract to the American Water Softener Company, Philadelphia, for water softener equipment in treating plants at North Dayton, Ohio, Troy, Old River Junction, Lima, Deshler, Rosford and Fairmount, W. Va. The contract for the construction of buildings, tank foundations and the installation of piping and pumping machinery at Troy, Old River Junction, Lima, Deshler and Rosford has been awarded to Joseph E. Nelson & Sons Company, Chicago. This company has awarded a contract to the Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., for the construction of three water treating plants at Tontogany, Ohio, Wapakoneta and Twin Creeks. This company has placed contracts with the Jobson-Gifford Company, New York, and the Kelly-Atkinson Construction Company, Chicago, covering respectively the erection of the superstructure for a new highway bridge crossing near Buhls, Butler county, Pa., and erection of a grade crossing elimination bridge near Salisbury Junction, Pa.

The Canadian National and the Canadian Pacific have made a proposal to eliminate grade crossings along the Toronto water front and bring into use the Toronto Union station which calls for an expenditure estimated at $20,476,000, of which the city would pay $4,633,000. It is proposed to substitute the new plan for an agreement made in 1913 to eliminate grade crossings by means of a long viaduct, a project which would cost $32,000,000. The railroads favor the substitution as less expensive and more satisfactory, and also point out that th erevised plan could be carried out in 10 months, as against three years in the case of the 1913 plan.

The Canadian Pacific has awarded a contract to Luney Bros., Victoria, B. C., for the construction of the steamship terminal building at Victoria, B. C., to cost about $200,000.

This company has awarded a contract to J. W. Mohler, Camrose, Alberta, for the extension of the Edmonton, Dunvegan & British Columbia from Grande Prairie, B. C., to a point 15 miles west, and of the Central Canada from Berwyn, B. C., to a point 13 miles west.

The Chesapeake & Ohio has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of water treating plants at Moorehead, Ky., and Olive Hill, and Hurricane, W. Va., and Sproul.

The Chicago & Alton will construct a two-story freight and passenger station at Hardin, Ill., the new terminus of the Eldred branch.

The Chicago & North Western will construct a storehouse at Casper, Wyo., at a cost of approximately $14,000.

The Chicago, Milwaukee & St. Paul plans the construction of a new enginehouse and shop at Monticello, Iowa, to cost approximately $60,000.

The Chicago, Rock Island & Pacific has awarded a contract to the Howlett Construction Company, Moline, Ill., for the construction of a 400-ton electric automatic coaling station of frame construction, with sanding equipment, at Rock Island, Ill., and a contract to T. S. Leake Construction Company, Chicago, for the remodeling of its passenger station at Englewood, Chicago.

The Denver & Rio Grande Western will construct extensions to its yard at Burnham, a suburb of Denver, Colo., at a cost of $250,000, also a concrete viaduct over its tracks at Eighth street, Pueblo, Colo., at a cost of approximately $350,000.

The Erie has awarded a contract to Roberts & Schaefer Company, Chicago, for the construction of a 200-ton steel automatic electric coaling station at Brier Hill, Ohio.

The Evansville, Indianapolis & Terre Haute has applied for authority to construct a branch line six miles long in Gibson and Pike counties, Ind.

The Fort Dodge, Des Moines & Southern (electric) has awarded contracts to the W. J. Zitterell Construction Co., Des Moines, Iowa., for the construction of a brick and concrete car house and yard office at Fort Dodge, Iowa, to cost $150,000, and for the construction of a new car house at Boone, Iowa.

The Grand River Valley (electric) will construct an extension of its lines from Fruita, Colo., to the High Line district, a distance of three and one-half miles, at a cost of approximately $65,000.

The Great Northern, together with the Northern Pacific and the Chicago, Milwaukee & St. Paul, have agreed to construct a belt line around Tacoma, Wash. If the Union Pacific, which is now considering the proposal, approves the action, the construction of the line will be undertaken at once.

The Gulf Coast Lines will construct a brick passenger station, 44-ft. by 208-ft., at Mercedes, Tex., at a cost of $25,000, also a new enginehouse and repair shop at Brownsville, Tex., to cost $100,000.

The Gulf, Colorado & Santa Fe contemplates the construction of a spur track from Oak Cliff, Tex., to West Dallas, a distance of approximately 6½ miles.

The Houston & Texas Central plans the construction of an addition to its passenger station at Austin, Tex., at a cost of $16,000.

The Illinois Central has prepared plans for the construction of additions to its shops and yards at Evansville, Ind., to cost approximately $1,000,000, and plans the construction of a brick passenger station with two 700-ft. brick platforms at Carrollton avenue and Edinburgh street, New Orleans, La.

This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a new freight station and a passenger station at Baton Rouge, La., to cost approximately $500,000; has awarded a contract to the Drumm Construction Company, Chicago, for the construction of a concrete pit and scale house at Harahan, La., and a contract to Jerome A. Moss, Chicago, for the construction of a new passenger station at Normal, Ill., to cost $25.000.

This company, jointly with the Pennsylvania, is calling for bids for the construction of a two-story brick passenger station at Effingham, Ill., to cost approximately $60,000.

This company's plan to build a cut-off line from Edgewood, Ill., to Fulton, Ky., has again been subjected to investiga-

tion by the Interstate Commerce Commission. This is in response to protests made by the state of Illinois and representatives of the communities interested. Argument in the case will be heard on December 12, at Washington, by the entire commission.

The Kansas & Missouri Railway & Terminal Company has been authorized to construct a belt line in Wyandotte county, Kan.

The Lake Terminal has awarded a contract to Roberts & Schaefer Company, Chicago, for the construction of a 200-ton reinforced concrete automatic electric coaling station and gravity sand plant with mechanical cinder handling plant at Lorain, Ohio.

The Louisville Railway (electric) is preparing plans for the construction of an interurban union station, 200-ft. by 500-ft., at Louisville, Ky., to cost approximately $1,250,000. The lower floors of the building will be used for stores, waiting rooms and platforms and the upper floors will be devoted to office space.

The Michigan Central has awarded a contract to Ellington-Miller Company, Chicago, for the construction of an eight stall roundhouse, a cinder pit, water and sewer lines and a number of auxiliary buildings at Lansing, Mich., to cost approximately $125,000.

The Missouri-Kansas-Texas has awarded a contract to H. B. McCoy, Cleburne, Tex., for the construction of additions to its car shops at Denison, Tex., to cost approximately $200,000.

The Missouri Pacific plans the construction of a one-story brick passenger station at Newport, Ark., to cost approximately $70,000; has awarded a contract to J. J. Wuellner & Son, Alton, Ill., for the construction of a one-story brick passenger station at Bald Knob, Ark., reported in the November issue, and has been ordered by the Arkansas Railroad Commission to construct a brick passenger station at Newport Ark., at a cost of $70,000, the plans to be completed within 60 days.

The Nashville, Chattanooga & St. Louis is preparing plans for the construction by company forces of a ballast plant at Cumberland, Ala., with a capacity of 500 cu. yd. per day.

The New York, Chicago & St. Louis will construct a new enginehouse and locomotive repair shop at Fort Wayne, Ind., on land recently purchased as a site for a new freight terminal and yard, as reported in the October issue.

The North and South has applied for authority to construct and operate a railroad from Miles City, Mont., to Casper, Wyo., 332 miles, and to acquire and operate as part of the line any lines now constructed or under construction over the route. The application was filed by William Cannon, 383 Madison avenue, New York.

The Oklahoma Union contemplates the construction of an extension 32 miles long from Keifer, Okla., to Nuyka, where it will connect with the Oklahoma-Southwestern.

Outer Island Logging Road will construct a 12-mile standard gage logging road on Outer Island in Lake Superior, 40 miles from Ashland, Wis. The John Schroeder Lumber Company, Ashland, Wis., will undertake the work.

The Pennsylvania will construct a coal dock with unloading machinery and 60,000 ft. of storage track at Sandusky, Ohio, at a cost of $342,000

This company will elevate its tracks at the present grade crossing at Main street, Toledo, Ohio, and will eliminate other grade crossings in that city at a total cost of approximately $750,000. This company has been ordered by the Illinois Commerce Commission to construct, jointly with the Terminal Railroad Association of St. Louis and the Baltimore & Ohio, a subway under their tracks at Ninth street, East St. Louis, Ill. The subway will be 750-ft. long and will contain two 20-ft. roadways and two 5-ft. sidewalks and will cost approximately $480,000.

The Philadelphia & Reading has awarded a contract to O'Rourke Brothers, Philadelphia, for the substructure of a bridge carrying the tracks of its Norristown branch over Fountain street, North Manayunk, Pa., the water-proofing to be carried out by Martin & Breen, Inc., Philadelphia.

This company has awarded a contract to the Curtis-Grindrod Company, Philadelphia, for the erection and furnishing of a one-story brick washroom building, 13-ft. wide by 89-ft. long, in connection with the new terminal at Camden, N. J.

This company has recently awarded a contract in connection with the ventilation of its Mahanoy tunnel to the B. F. Sturtevant Company, Washington, D. C., for fans, ducts, and motors and to Woodfield-Thompson Company, Philadelphia, for the electrical equipment for lighting and power. The company has awarded a contract to the Roberts Filter Mfg. Co., Darby, Pa., for sand filtration equipment at its Bulson street enginehouse, Camden, N. J. A contract has been awarded to the Glenwood Tile Company, Philadelphia, for marble and slate work at Camden, N. J., in connection with the company's $3,000,000 terminal for its seashore lines. The company has also awarded a contract to the Guarantee Construction Company, New York, for coal and ash bunkers with skip hoist equipment for the powerhouse under construction at Port Richmond, Philadelphia.

This company will spend approximately $1,600,000 for new machinery, additional piers and other ore handling equipment at Port Richmond, Philadelphia. This equipment will be in addition to the new grain elevator being built there at a cost of $3,000,000 and the new McMyler coal dumper at a cost of $1,250,000. This company has awarded the following contracts in connection with its new engine yard at Rutherford, Pa.: To C. W. Hunt & Co., West New Brighton, N. Y., for coaling station and sand facilities; to the Belmont Iron Works, Philadelphia, Pa., for the steel for a crane runway and for ash and inspection pits; to Fish, Bower, Rutherford, Philadelphia, Pa., for the construction of ash pits, crane runway foundations, inspection pits, water column foundations, grading, water supply and drainage.

The Pueblo Conservancy District, through the Dayton Morgan Engineering Company, Dayton, Ohio, will call for bids in November or December for the construction of flood control work at Pueblo, Colo., involving the construction of a new river channel to carry 125,000 cu. ft. per second of water, 34 miles of railroad tracks and a barrier dam 35 ft. high and 3,060 ft. long. The project, which will cost approximately $4,003,000, includes a three track concrete through girder bridge, 200 ft. long; five bridge substructures; one 400-ft., double-track through railroad bridge; reconstructing several existing spans and supplying new viaduct steel spans; one 400-ft. double-track through pin connected railroad bridge; one 280-ft. through pin connected steel highway span; 35 miles of standard gage of railroad track; removal of 35 miles of present main line and yard tracks.

The St. Louis-San Francisco contemplates the construction of a new passenger station at Enid, Okla., and will close bids on December 17 for the construction of a one-story brick passenger station at Lindenwood, Mo.

St. Louis-Southwestern, jointly with the city of Dallas, Texas, will construct a subway at Lemmon avenue in North Dallas, Texas, to cost about $75,000.

This company plans the erection of fuel oil storage tanks in Camden, Ark., to store oil for the supply of the entire system. The plans call for 10 tanks of 55 bbl. capacity each. The total cost of the project is estimated at $200,000.

The St. Paul Union Depot plans the construction of a roundhouse, adjoining the Union Depot yards, at St. Paul, Minn., to cost approximately $75,000.

Soda Lake, owned by the Pacific Distributing Corporation, San Francisco, Cal., has awarded a contract to W. C. Burch of San Luis Obispo, Cal., for the construction of a narrow gage railroad eight miles long to Soda Lake, Cal.

The Southern has awarded a contract to the Hardin Construction Company, Lexington, Ky., for the construction of a brick passenger station at Lexington, 36-ft. by 95-ft., to cost $18,500, and has awarded a contract to the Smallman-Brice Construction Comptny, Birmingham, Ala., for the construction of a passenger station at Selma, Ala., to cost $25,000. This company contemplates constructing new shop buildings and roundhouse facilities at Valentine, Tex.

This company, jointly with the city of Beaumont, Tex., will construct a viaduct over its tracks at Short and Mariposa streets, Beaumont, Tex.

The Southern Pacific will construct a new passenger station at Lindsay, Cal., and the enlargement of its passenger station at Houston, Tex., at a cost of approximately $25,000.

It will also construct with the company forces an addition to its engine terminal at San Antonio, Tex., at a cost of $80,000, the work to include a boiler washing plant.

This company is calling for bids for the construction of the third section of the Natron cutoff of the new line between Eugene, Ore., and Klamath Falls. The third section will extend from Kirk, Ore., to a point 42 miles north and will include a 3,300-ft. tunnel. This company has also awarded a contract to John Hampshire, Grants Pass, Ore., for the construction of the second section of the Natron cutoff, 5½ miles long, Mr. Hampshire being the same contractor to whom the contract for the first section, 31 miles long, was recently awarded.

The Southern Pacific of Mexico will construct a bridge over the Culiaton river in Sonora, Mexico, to cost $250,000.

The Tennessee Central contemplates the construction of a four-story passenger station and office building at Nashville Tenn., to cost approximately $150,000.

The Union Pacific has awarded a contract to the Unit Construction Company, San Francisco, Cal., for the construction of an enginehouse with a repair department, 75-ft. by 175-ft., at San Pedro Harbor, Los Angeles, Cal., and contemplates the construction of a subway under its tracks at Thirty-eighth street, Denver, Colo., for the accommodation of street traffic, the Union Pacific to pay 70 per cent of the cost.

The Wabash has prepared plans for an addition to its enginehouse and shops at Moberly, Mo., to cost $65,000, and has prepared plans for a 37-ft. by 140-ft. addition to its company hospital at Decatur, Ill., to be undertaken in the spring.

The Waco, Beaumont, Trinity & Sabine has applied for authority to construct an extension from Livingston to Beaumont, Port Arthur and West Port Arthur, Tex.

Equipment and Supplies

The Chicago, Indianapolis & Louisville has ordered 4,000 tons of rails from the Illinois Steel Company.

The Chilean State Railways issued an inquiry during the month for 15,274 tons of 100-lb. Chilean section rails.

The Louisville & Nashville has ordered 10,500 tons of rails from the Tennessee Coal, Iron & Railroad tCompany. This company has ordered 800 tons of structural steel from the Virginia Bridge & Iron Company, 300 tons from the American Bridge Company, and 150 tons from the Louisville Bridge & Iron Works.

The Missouri-Kansas-Texas has ordered 10,000 tons of rails from the Illinois Steel Company and 8,750 tons from the Tennessee Coal, Iron & Railroad Company.

The Missouri Pacific has ordered 10,000 tons of rails from the Colorado Fuel & Iron Company, 8,000 from the Tennessee Coal, Iron & Railroad Company, and 14,000 from the Illinois Steel Comtpany.

The New York Central is inquiring for 25,000 tons of tie plates and opened bids on November 28 for 9,000 tons of spikes and bolts.

The Norfolk & Western has ordered 18,000 tons of rails from the United States Steel Corporation.

The Pennsylvania has ordered 94,000 tons of rail from the U. S. Steel Corporation, 94,000 tons from the Bethlehem Steel Corporation and 12,000 tons from the Inland Steel Company.

The Philadelphia & Reading has ordered 25,000 tons of rails from the Bethlehem Steel Corporation and 10,000 tons from the Carnegie Steel Company.

The Virginian Railway has placed an order with the Carnegie Steel Company for 8,000 tons of rails,

Supply Trade News

General

The Jones & Laughlin Steel Corporation has moved its Cleveland sales office from 1314 Rockefeller Building to 1407-11 Union Trust Building.

The Black River Tie and Timber Company, of which O. S. Roeder is secretary and treasurer, has been incorporated in Missouri and has opened offices in the Railway Exchange Building, St. Louis, Mo.

The Case Crane & Engineering Company, Columbus, Ohio, has acquired the Kilbourne & Jacobs Company, which will hereafter be operated as the Kilbourne & Jacobs Manufacturing division of the company. This factory has been operating continuously without interruption under the receiver, and shipments of standard material during certain months of the receivership have been the largest in the history of the business. The new owners are now manufacturing and expect to continue to manufacture all of the standard Kilbourne & Jacobs products, including wheelbarrows, scrapers, etc., warehouse trucks, air dump and other cars.

Personal

D. P. Bennett, vice-president of the Pittsburgh Steel Company, Pittsburgh, Pa., has been elected president, and **E. H. Bindley,** a director, has been elected vice-president. **Henry J. Miller** was elected a director to succeed the late **Willis T. McCook.**

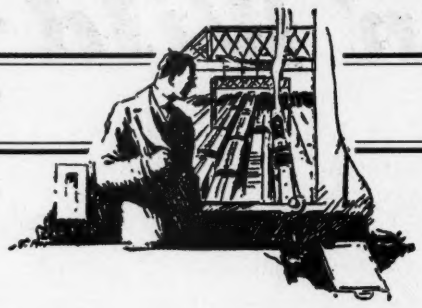
Stuart B. Over, formerly senior assistant engineer in the valuation division of the Interstate Commerce Commission, and **Francis Tingley,** formerly supervisor of overhead lines for the Washington Railway & Electric Company, Washington, D. C., have formed a partnership under the name of **Over & Tingley,** to engage in general engineering at Darby, Pa.

Charles M. Brown, who has been elected president of the Colonial Steel Company, Pittsburgh, Pa., was born on October 16, 1870, at Pittsburgh. He graduated from Yale University in 1891, subsequently to that year served with Howe, Brown & Co., Ltd., Pittsburgh, until that firm was absorbed by the Crucible Steel Company of America. He served for one year in the sales department of the latter company and in 1901 became secretary and general sales manager of the newly formed Colonial Steel Company. He was made vice-president in charge of sales in 1917.

Hillis F. Hackedorn, district manager at Chicago of the H. H. Robertson Company, Pittsburgh, Pa., died suddenly in Chicago on October 19. Mr. Hackedorn was formerly president of the Hackedorn Construction Company of Indianapolis, Ind., where he was engaged principally in the construction of bridges, prominent among which was the rebuilding of bridges at Dayton, Ohio, following the flood in 1913. He served as a major in the Ordnance department of the United States Army at Philadelphia, Pa., during the war and subsequently he was appointed editor and general manager of an engineering and construction journal, with headquarters at Chicago. He resigned this position to enter the service of the H. H. Robertson Company in the capacity of branch manager of the Detroit, Mich., office, and in December, 1921, he was appointed district manager, the position he held at the time of his death.

Hillis F. Hackedorn

Buyers' Guide



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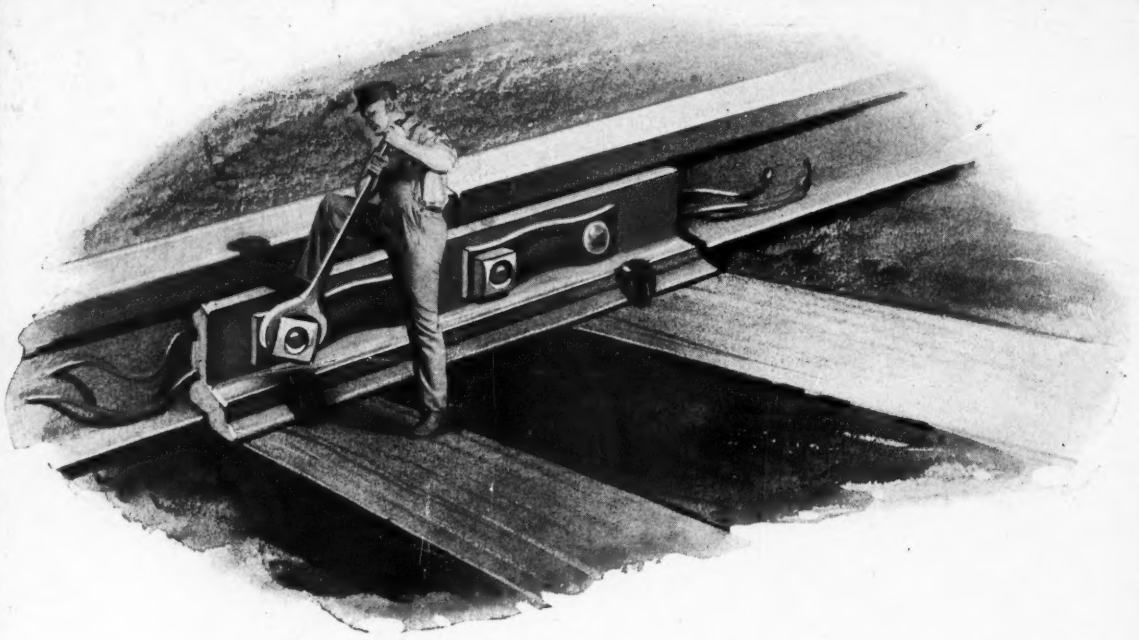

The track man that works under the snow

DURING the summer months all hands have striven for one thing: to get your track in readiness to carry the heavy traffic during the winter months. Then bolt tightening is almost impossible until spring, and far too often wrecks, derailments and delays occur that would have been prevented by tight rail joints.

The Verona Rail Joint Spring tightens bolts faster than they can become loose. If a bolt should stretch, or rust, or wear, the spring instantly takes up the resulting slack. It delivers much more reactive pressure thru a much greater distance than any other nut-locking device.

Winter and summer, in the open sunshine or down under the snow, the Verona Rail Joint Spring is on the job—always. It makes joints tight; and despite stretch, wear, rust, ice or snow it ***keeps*** them tight.

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